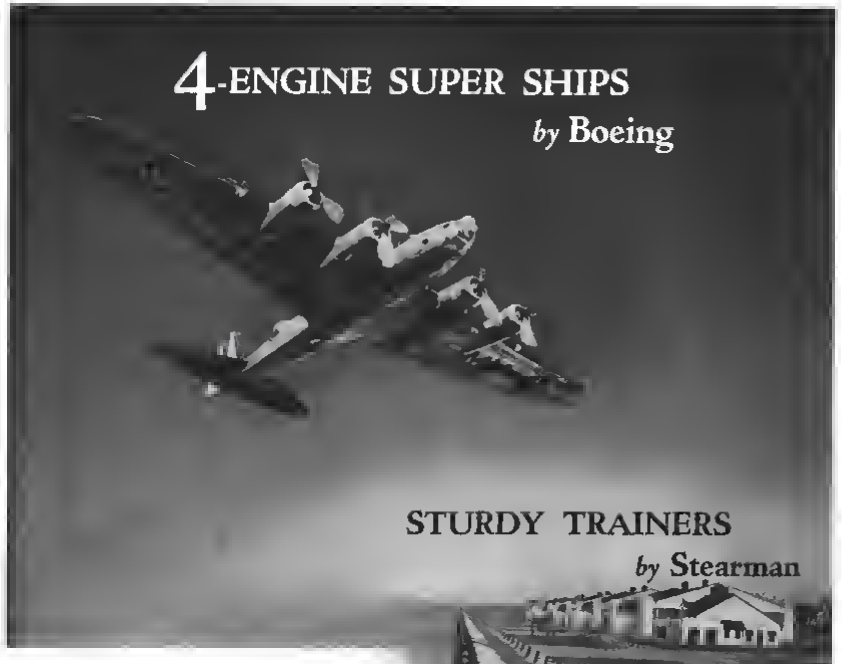
McGraw-Hill Publishing Company, Inc. OCTOBER, 1938 Price 35c. per copy

AVIATION

The Oldest American Aeronautical Magazine

Published monthly; price 25c a copy. Subscription rates—United States, Canada, Mexico and Central and South American Countries $3.50 a year. All other countries, $3.50 a year or 14 shillings. Entered as second class matter September 3 1930 at the Post Office Albany N. Y. under the Act of March 3 1879. Volume 37 Number 10.



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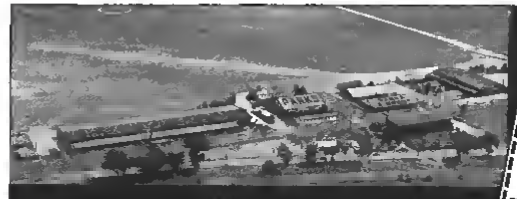

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AN OPEN LETTER

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We urge your investigation of the Waco N -- the world's safest sedan-type airplane!

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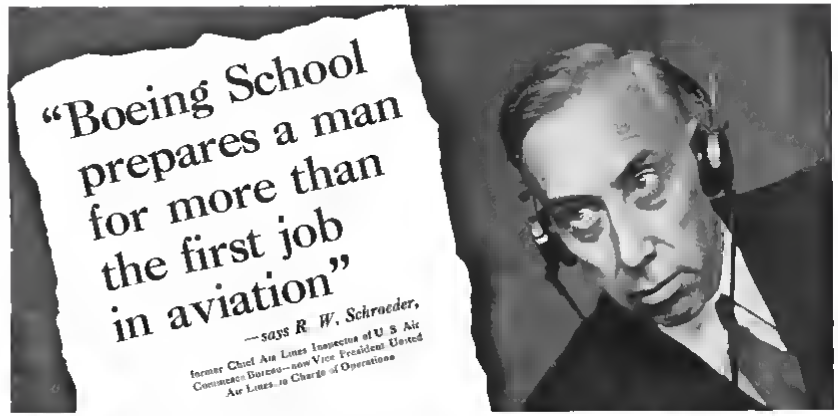
*Department of Commerce data indicates that 69% of the landing and taxiing mishaps in pleasure and commercial flying during the first six months of 1937 were ground-loops, nose-overs and other difficulties which cannot happen in the Waco N.

1938 MODEL S (left) Greatest passenger-mile value of any airplane. Four or five place cabin. Wide landing gear

1938 MODEL C (right) The finest conventional sedan type of plane. Roomy comfort for four or five persons. Fast or

LET THE YOUNG FLY SOONER... AND THE OLD FLY LONGER



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(August 1937—July 1938)

Months	Number Graduated	Number Placements	No. Cos. Employing Graduates
1937			
Aug.	4	2	2
Sept.	20	17	7
Oct.	4	3	2
Nov.	2	2	2
Dec.	29	7	3
1938			
Jan.	7	14	6
Feb.	1	9	7
Mar.	48	16	6
Apr.	6	15	3
May	6	12	6
June	38	5	4
July	4	11	4
TOTAL	155	108	26

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MAJOR AL WILLIAMS alias 'Tattered Wing Tips'
Mgr. Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

NEW BUSINESS DEPT.

We're thinking about inaugurating a new feature, a sort of monthly Aviation Quiz to cover anything from the names of five planes beginning with Z to What's the best thing to do if your motor drops out at 20,000 feet?

But, first, let's have your comments with a few suggestions as to suitable questions. Don't let us down. Give us permission to use your name and we'll give you a credit line. *No foolin'!*

FOR THE MATH-MINDED

You have 40 gallons of Gulf Aviation Gas (advt.) You want to be able to measure any number of gallons from one to forty. The only way you can do it is by pouring it into cans. Which, by the way, may be any size.

So-o-o . . . what is the fewest number of cans needed to do the job? Also their sizes? The only condition (this is what hurts the most) is that you can use a can only once in measuring any given amount.

(Mail your answer to T. W. T. You'll be surprised and pleased, probably more surprised than pleased, when you see the correct result.)

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THIS MONTH'S WHOPPER

Dear Major

Well, sir, last week I was cruisin' on my little boat, The Question—(her full name Yawl Ketch Any Fish?)—when I seen an airyplane bobbin' up and down on the water. "Hey," hollers the pilot, "where's the nearest landfall?"

Well, sir, I couldn't resist that one. What do you want a landfall for?, I yelled. "You've done made a waterfall!"

But he didn't laugh none. "I'm outta gas," he says, nasty-like. "You got any?"

"No gas here," I comes back. "This thing runs on wind."

So does this!" he snaps, "but it takes gas to start it! Where am I, anyway? Can't be the Missouri 'cause I don't see no mud!"

"It's the Missouri, O.K." I tells him. But she's growed a little. This yere's the Gulf of Mexico!"

"Quit your kiddin'," he says, suspicious-like. "I don't hear no Spanish Music. Besides all this palaver ain't gettin' me no gas!"

Then he sort of snapped his fingers and clomb out on the wing. I thought she was sinkin', but no! By grannies, he began to pat that engine and talk to her. And dang my binnacle's barnacles if it didn't bust out into a roar!

"How'd that happen?" I hollers.

"Well," says he, throttlin' her down, "you told me where I was and that was enough. I just whispered into her ears. Honey, this is the Gulf . . . this is the Gulf." That's all she needed. Just mention the word Gulf to a plane engine and she feels like a kid. They ain't nothing like Gulf Aviation Gas, sailor. Honest, they run better on the thought of Gulf Aviation Gas than on some stuff out in a pump.

And dang my rudder post, if he didn't take that thing offen the water and buzz outta sight! That's why I'm gettin' a motor for The Question, straight. I wanta burn that Gulf Aviation Gas, too.

R. H. Wade

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF AVIATION PRODUCTS

THE
OLDEST AMERICAN
AERONAUTICAL MAGAZINE

AVIATION

Established 1916
McGraw Hill Publishing Company Inc.

Published monthly price 35c a copy Subscription rates—United States, Canada and Latin American republics $3.00 a year. All other countries, $5.00 a year or 20 shillings. Entered as second-class matter September 3 1928 at the Post Office Albany N Y under the act of March 3 1879. Printed in U S A. Cable address McGrawhill New York. Member of A.B.C. Copyright 1938 by McGraw Hill Publishing Company Inc. 330 West 42nd Street, New York, N. Y. The following publications are combined with AVIATION: AERONAUTICAL ENGINEERING, AIRCRAFT JOURNAL and THE AVIATION NEWS.

Westland Lysander for Army

Contents for Vol. 37, No 10

OCTOBER 1938

A McGRAW-HILL PUBLICATION

Flashes From the Skyways of the World

» ONE OF THE MOST STRIKING, and at the same time most important parts of the duly program at the Cleveland Races was the little show that Mike Murphy put on with his 50 hp. Piper Cub seaplane, making take-offs and landings from the turf as easily as though he were afloat. Occasionally in emergencies pilots have landed seaplanes on fields before, but, as far as we can discover, Murphy's performances were the first demonstration of successful take-off with a seaplane from land. The demonstration should be a great source of comfort for seaplane owners when they have to cross territory without a duck-pond in sight. There was nothing tricky about the ship or the float installation. The floats were Edo's standard model 1140, and the attachments had not been beefed up in any way. The only modification was the attachment of a steel rubbing strip on top of the regular dural keel, and that was applied only to prevent too rapid wear of the keel from the repeated landings and take-offs during the three day demonstrations.

» AND WE GOT A GREAT KICK out of watching Emil Kropf put the Fesler Storch through its paces. The ship may be clumsy and awkward looking and not too fast, and its aerodynamic features not too new, but it certainly does things beyond the range of the average airplane, and for that reason deserves study.

» VISITATIONS OF THE MONTH: Apart from the Races, the editors did a lot of visiting about the country in the last month or so, as these notes from our book will show. . . . Don Luscombe's school and shops (Trenton) are busy now turning out the Model 50s (see page 44) on which ATC came through several weeks ago. Five have been delivered and another lot was nearing completion. A Phantom on Edo floats was being packed for South America the day we were there. . . . Fleetwings (Bristol) is finishing up an Army order for steel replacement wings for Douglas Dolphins and is working on a series of five of the new Seabirds. Carl de-Ganahl had one of them out at the Races for demonstration, and rumours were floating about of a couple of sales. . . . Rohm and Haas (Plexiglass) had a number of plastic applications on view in their Philadelphia offices. Dr Frederick and Mr Atwater had a number of interesting ideas to discuss relative to structural plastic materials. . . . The Naval Aircraft Factory is a busy place now that the 10 per cent production rule under the Vinson Act is going full blast. Both planes and engines are being produced. Our thanks to Commander Nelson for his courtesies, and a very pleasant lunch in the officers' club. . . . An hour's conversation with RCA's Dave Little is always packed with pertinent dope on the present state of the radio art. Dave had just come in from a "vacation" of 15 days of (very) active duty with his Naval Reserve unit. . . . At Bellanca's in New Castle in time to see a big Aircruiser for MacKenzie Air Service pushed out onto the field for flight test, and to watch for a while the grooming of the ex-Papana tri-motored monoplane for the Bendix Race. The light plane first exhibited at the Chicago Show was being prepared for production. . . . To Martin's at Baltimore to meet Marsh K. Powers, new public relations man. Glimpsed Joe Hartson, busy as the proverbial bird-dog, trying to clean up a mess of details before leaving on a much deserved vacation. . . . Bendix Radio at Baltimore, with a shop chuck full of equipment

"Maguire got the idea at Cleveland"

for the airways and the services. Our thanks to Mr. Hyland for his personally conducted tour of the shops, and for an hour's interesting discussion of radio and allied problems. . . . On to Washington to visit with several members of the CAA, and to go to work with Ed Paxton of the ATA on certain of the material for the Public Relations section of this issue. . . .

Met Fred Weick (also cleaning up to shove off on a vacation) out at the Sligo Mill Road plant of Engineering and Research, then on with him to the College Park field to see his new ship fly. Can't say much about it now but Fred promises us full details at an early date. It has lots of interesting things about it, as anyone knowing Fred could guess. It is powered with a new motor, on which details are still lacking. Engineering and Research is building a new plant at College Park which is rapidly nearing completion. It has a flying field of its own adjacent, from which the ships can be flown. . . . Stopped in at Annapolis for a few minutes to see where the men who officer our Navy come from. . . . Moving north, put in at the Curtiss plant at Buffalo. There's a busy place for you, with P-36s for our own Army and Hawk 75s for export pouring out the back door. The plant has been entirely revamped in the past year, and now has one of the most beautiful straight-line production arrangements we have ever seen. And it is still expanding. Al Williams gave us a good look at its several departments. In the course of the trip we met Burdette Wright with a distinguished visitor in tow, Handley Page on a visit from England. Saw him again later at the Races. . . .

Larry Bell was on the high seas returning from Europe when we dropped in at his plant, but Ray Whitman took time out to show us what could be seen around the place. The wing panel orders for Consolidated are pretty well cleaned up, and work is well along on the early stages of production on the Air Corps order for Arcadias. . . . Dropped in for a minute or two at Joe Gwinn's plant to express our sympathy for the tragic accident of the week before. . . . To Irving Air Chute for a pleasant talk on parachute problems with President George Waite. . . . Last stop before Cleveland was at Erle at the new plant of Lord Manufacturing Company where we got a new slant on the problem of vibration control on aircraft. Lord has developed an astonishing array of gadgets to lick vibration on everything from the most delicate instrument to a 2,000 hp. engine. . . .

Side Slips

By
ROBERT OSBORN

» ORTMAN, three laps from the finish, lost all the oil pressure in his engine and began to be spattered with oil in the cockpit, presumably from a broken line to the motor. He pulled up to a higher altitude and radioed a request that the airport be cleared for a forced landing, but refused to pull out of the race so long as his laboring engine continued to function'—*N. Y. Herald Tribune* description of the Thompson Trophy Race.

A radio in a racing plane seems to be a novel idea. We suppose it won't be long before racing pilots will be flying a radio beam to keep on the course and new racing designs will include accommodations for sight seeing passengers.

» CONSIDERING the manner in which the lady pilots have been cleaning up National Air Race prizes in recent years it would seem to be high time

for the officials to start setting aside 'consolation" prizes for the men.

» THE WOMAN'S PLACE may be in the home, as the old political chant used to claim, but it appears definitely established that her place is in the cockpit also. We suppose manufacturers will soon be putting out planes finished in beige, Burma wine, heather, plum plaid, nude and romance blue, and featuring helmets trimmed in the manner of the new "do!!" hats.

» THE CIVIL AERONAUTICS AUTHORITY has certainly started off on the right foot in acquiring the services of C. B. Allen, Aviation Editor of the *N. Y. Herald Tribune*, as consultant on information and public relations. United Aircraft is likewise to be congratulated on the appointment of L. D. (Deak) Lyman of the *N. Y. Times* as Assistant to the President. Not only are they Gentlemen of the Press in every sense of that word but they know very thoroughly what makes the airplane business tick. Also, in their moments of relaxation and conviviality, they are capable tellers of excellent stories and if AVIATION were not a fine upstanding family magazine we should like to print some of them.

« SPEAKING OF INVENTORS we are reminded of an incident which shows very well how persistent they can be in the belief of the value of their ideas.

When Bill Miller was Chief of Aerodynamics for Curtiss an inventor came in with a patent on a direct-lifting machine. He talked enthusiastically a long time, pointing out the merits of his idea. Bill listened attentively and studied the mechanism thoroughly, but finally had to give his opinion that the machine as laid out wouldn't develop any lift. "In fact", said Bill, "it looks to me as if it would have a small negative lift."

Alright," said the inventor, not the least discouraged, "Turn it upside down and fly it that way."

Piper Cub seaplane over Miami

RACE REFLECTIONS

To ANYONE who fought and bumped his way out of Cleveland's post-race traffic on Labor Day afternoon, it is no news that this year's National Air Races were more popular with the public than ever. Industry groups may have sat about with bored yawns at stunting routines and at familiar military evolutions, but thousands of housewives, bond salesmen, and insurance brokers were nursing sunburned tonsils and taking aspirin after the echoes of the last signal bombs had died away.

And this time they had been treated to a better-than-usual show. The two feature races were exciting enough and the aerobatics daring enough to provide plenty of thrills. At the same time they had been shown many types of aircraft performing routine tasks easily and safely, from the unconventional Fiesler Storch, to the conventional DC-3 transports. The military display, too, gave the lay spectator some inkling of progress in the building up of our national air defenses.

We were especially glad to note that extraneous trick automobile acts had been washed out this year and that a certain degree of restraint was used in dishing it up over the Public Address system. By and large, the management had made an obvious effort to put "aviation on parade" and took a recognizable step in the direction of trying to improve the public's understanding of what it is all about. All of which is very much to the good. Good going, Cliff!

But the biggest lift that we got out of the races was a non-scheduled performance. Each day, as soon as the last racer was on the ground, the field was opened for normal traffic. The people who had flown in with their own ships took off for home by twos, by threes, fives, and tens, until the air was literally full of airplanes. This was not aviation on a staged parade, but aviation in everyday use, the kind of flying in which we as an industry are vitally interested. Never before have we seen so many and such a varied lineup of privately owned ships in the parking spaces. To us it was a glimpse into the future, toward the time when the airplane parking problem may become as important as the automobile parking problem, not only at National Air Races, but at football games, boxing bouts, corn roasts and such like.

FIRST MONTH

ENCOURAGING is the way in which the Civil Aeronautics Authority has settled down to work. Original confusion in Washington offices is getting squared away. People in the old Bureau of Air Commerce are beginning to realize that no immediate changes are in sight in their set-up or routine, and are settling down into CAA harness.

Although at the time of this writing there are still a few gaps in the personnel lineup, certain key positions have been well filled. Private fliers should take satisfaction in the appointment of Grove Webster as chief of the section on private flying. It is apparent from this and from conversation with members of the Authority that the problems of the non-scheduled operator are of equal importance in their minds with problems of air transport.

The Authority has done well also in appointing Carl Allen of the *New York Herald Tribune* to head up its public relations program. Allen has had long experience, both in the newspaper field and aviation, and has a well deserved reputation for presenting aviation facts as he sees them. We understand that he is serving the CAA in an advisory capacity as well as in its press relations, and we think that his knowledge will go a long way toward leveling up some of the irregularities in the Authority's non-aviation experience. We hope, however, that he can be persuaded to stay on the job longer than the announced 90 days. The CAA will need him longer than that.

But the most important move that the CAA has made so far has been to sit down for a two-day conference with the air transport people in Chicago immediately following the Cleveland races—and a sound idea it is for airline executives to meet with and become personally acquainted with their governing body. One of the first announced results of the conference has been the formation of a cooperative safety program under the chairmanship of American Airlines' energetic Ralph Damon. To promote safety in winter operations the lines have agreed (a) to change flight schedules to reduce cruising speeds; (b) to standardize on a basis of 50 per cent of power, (c) to adopt uniform weather regulations so that no line will operate trips in weather in which other operators refuse to fly, and (d) to cooperate more closely on weather reporting, engineering, radio, traffic and advertising.

Not bad for the first month's work. The sooner the CAA and the various industry groups can sit down with their feet under the same table the sooner we can hope for solutions to many of the problems that are now dangling in mid-air.

CONGRATULATIONS, ARMY!

—ON THE WINNING of this year's Collier Trophy. When the score of the next ten years' progress is added up there will be few more important projects recorded for this period than the development of methods for sub-stratosphere flying. The contributions made by the Air Corps and the Lockheed company in the Army's sub-stratosphere project of 1937 will stand as the practical beginning of the next stage in flight progress. We have no doubt but that this year's selection will prove popular with the entire industry.

Wittman snipe off a little drag

MEN WITH very, very small WINGS

Race-plane design progress as seen at the 1938 National Air Races, with particular reference to efficiency. Here "K" marks the spot.

By Charles F. McReynolds
West Coast Editor AVIATION

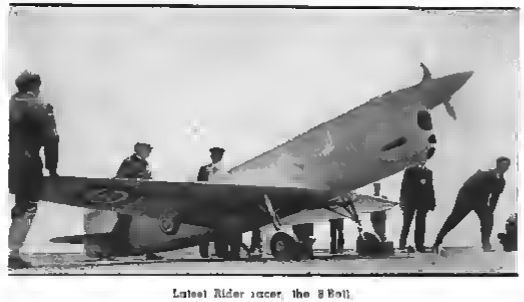
THE effort to achieve high speed by progressively clipping off wing area and by piling in the horses is as old as aviation itself. Glenn Curtiss was able to fly rings around the original Wright pusher by knocking some 40 per cent off the Wrights' wing area and boosting his power by 50 per cent. But there is a limit to everything, and serious minded observers have been more than a little concerned over the extremes of the last few years in race plane design. Some of the little jalopies have had their wings pared down almost to the vanishing point, and it has become quite a critical problem to get them off and to get them back on to the ground successfully. It does make sense, therefore, that a movement is under way to limit race plane design to certain prescribed ratios of power and wing area, or at least to a fixed ratio of cubic engine displacement to square foot of wing. Such a rule would certainly encourage more cleverness in design than is required in simply sawing off wing tips. At the present time the most efficient racers may not be the fastest. Under the new rule, efficiency and reliability would pay dividends rather than sheer dare-devilry.

This year we have had the opportunity of studying a number of the new racers closely. While exact information is difficult if not impossible to get we have gathered sufficient data to make a fair comparison of some of the racers on a basis of efficiency. This information is presented in an accompanying table which we have built up from a table originally published by E. P. Warner in AVIATION for November 1932. Through a breakdown of this table we are able to show the progress in relative speed efficiency of representative race planes built since the first Wright Pusher.

Our comparison is based on the familiar formula $V_{max} = K \sqrt[3]{\frac{P}{S}}$ in which it is assumed that a plane's maximum speed may be determined by taking the cube root of the figure representing horsepower available per sq. ft. of wing area and multiplying this by a factor K which represents the relative efficiency of the plane in question. Since K is the unknown and as it is the measure of merit that we are interested in determining we have written the formula $K = V_{max}/\sqrt[3]{\frac{P}{S}}$. Knowing the straightaway speed of any plane and its total power and wing area we may determine the relative speed efficiency of any plane.

K for the original Wright was 90. The Curtiss though 15 m.p.h. faster showed a K of 87. Warner has calculated that K for a pure Clark Y wing with 80 per cent propeller efficiency and no drag other than that of the wing, would approximate 215. It is, therefore, a fair assumption that any airplane will show an efficiency factor of less than 215, and any close approach to that figure would be most difficult. As high horse power and low wing area automatically places a high premium on achieving a maximum value of K, Warner calculated that a really high speed racer of 560 m.p.h. could not expect to show a value of K of higher than 173.

It is of interest to note from the table that at least one race plane, the Hughes Special has exceeded this figure. It should be noted that the Hughes plane was built solely to achieve a straightaway record. On the basis of the best information available the Hughes racer achieved a figure for K of 188.4, probably the highest landplane figure established.



Latest Rider racer, the 8 Ball

Of the racers at Cleveland we find that the new Chester Goon is outstanding on a basis of efficiency, with a rating of 172.4. Next comes the Schoenfeldt Firecracker with a rating of 165.3. But the Firecracker beat the Goon in the Greve. Just so we find that the Crosby, with a speed in excess of either the Delgado Flash or the Miss Los Angeles, has a lower efficiency rating.

Unfortunately we have been unable to secure detailed data on several of the Thompson Trophy racers in order to compare them on the basis of efficiency. Mr. Smoothie, the Conqueror powered racer that did not race, shows a purely theoretical factor of K of 185.

The practice of clipping wings and "suping" engines is too well known for comment. By such practices extreme speeds have been achieved. But even faster speeds, or greater safety, must be achieved through attention to the elusive K. This means, in simple language, reduction of drag. It means also greater propeller efficiency. It means retraction of landing gear, enclosure of cockpits, improvements in filleting, etc.

We rate Arthur C. Chester's Goon in top spot among interesting new race plane designs, both for its newness and for its all-around excellence. This is no slap at such veterans as the Turner-Laird, Marcoux-Bromberg, or Schoenfeldt Special, all of which have been at earlier nationals. But it does mean that we rate the Goon design ahead of Crosby's CR4 or the Rider 8 Ball, both of which are new this year.

Art Chester, in his search for the elusive K, chased it right into a corner and put it in a bag. The Goon is a prettily designed racing machine from nose to tail. With a conventional steel tube structure and two spar wood wing the Goon follows usual design as it does also with its full cantilever wing and tail surfaces and fully retractable landing gear, including tail skid. The Chester gear, folding back into the fuselage, is hydraulically operated, of rugged construction, incorporates oil and air shock struts, and retracts completely and without leaving a ripple on the fuselage belly lines. The Chester wing is of relatively generous area and moderate taper. Conventional split flaps are fitted. Of unusual interest is the mid wing mounting, use of symmetrical airfoil section and washout of incidence from 2½ deg. at the maximum to zero at both root and tip. When one considers that the wing tips are finished to a razor edge and the wing root is perfectly filleted through its mid position mounting, it is obvious that this wing is slipping through the air with a minimum of drag, and the wing fuselage drag has been reduced close to the point of perfection.

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Ortman's Marcoux-Bromberg racer

Progress in Speed and Efficiency Since the Wright Pusher

Name	Type	Year	Max. Speed V	Gross Wt. lb W	Max. H.P. P	Wing Area S	W/S	W/P	P/S	K
Wright	Pusher Biplane	1908	32	992	24	538	1 64	41 5	0 045	60
Curtiss	Pusher Biplane	1909	47	[illegible]	50	520			0 156	87
Deperdussin	Streamlined Monoplane	1912	105	991	160	97	10 20	9 61	1.03	104
Curtiss	Army Biplane racer	1932	226	2110	468	130	15 16	4 56	3 31	150
Verville-Sperry	Monoplane	1932	191	2225	400	156	14 82	5 56	2 66	136
Curtiss R3C	Biplane	1925	264		610	188		4 12	3 24	164
Laird Supersolution	Biplane	1931	268	2480	530	112	22 15	4 64	4 74	169
G. E. Supersport	Monoplane	1931	269	2280	535	88	25 90	4 26	6 08	167
Wedell-Williams	Monoplane	1932	277		535	100			5 05	161
SEAPLANES										
Savoia-Marchetti	Monoplane	1922	142	2378	300	247	9 67	7 92	1.21	133
Curtiss NC-3	Biplane	1925	246	17710	619	142	19 10	4 37	4 36	150
Macchi M-39	Monoplane	1926	261	3560	660	136	22 68	4 05	5 04	147
Supermarine S-5	Monoplane	1927	308	3242	870	115	28 20	3 73	7.57	157
Supermarine S-6	Monoplane	1929	531	5246	1950	145	36 16	2 69	13 45	136
Supermarine S-6B	Monoplane	1931	406	5995	2700	147	40 70	2 22	18 30	154
CURRENT RACERS										
Chambers	Monoplane—High Mid Wing	1938	280	1015	225	44	24 4	4 8	5 10	140 5
Delgado Flash	Monoplane—Low Mid Wing	1937	275	1560	320	60	26	4 9	5.33	157 2
McKeens Brown Special	Monoplane—Low Mid Wing	1934	272	1737	356	75	23	5	4 70	162 4
The Goon	Monoplane—Mid Mid Wing	1938	300	1640	400	76	22	4 2	5 26	172 4
Rider 70	Monoplane—Low Mid Wing	1936	300	1680	400	67	25	4 2	5 97	165 3
Mr. Smoothie (2361 2306)	Monoplane—High Mid Wing	1938	305	3080	850	95	32 4	3 62	8 65	185
Hughes Racer—Twin Wasp Jr.		1935	352	4980	900	138	35 5	5 44	6 52	188 4
					1164		38 5	4 3	7.96	176 3
Crosby CR4		1937	288	1940	400	64	30 5	4 85	6 25	152
Howard Mister Mulligan		1935	267	4210	Normal	156 7	27 9	5 07	5 5	162 6
Seversky Executive		1937	304	6755	1100	226	30 7	6 1	5 90	177 7

STREAMLINING— the ENGINEER

—or after college, what?

THE EDUCATION OF engineers generally, and aviation engineers in particular might well be divided into two parts: the transition period and the development period. Unfortunately the transition period is usually regarded as the entire educational process; in other words, we are accustomed to thinking of the engineer's technical education as that period in his life starting somewhere in his high school years and ending, almost abruptly, with his graduation from college. Nothing could be farther from the truth. It would be more accurate to say that his education is just beginning when he leaves college. Actually, however, there is no definite starting point for an engineer's education and there is certainly no end to it, the best we can do is to make a division somewhere through the process and designate the first and second parts as the transition and development periods, respectively.

The word transition is used advisedly—it defines the period during which the mind of the future engineer undergoes a gradual change in methods of thinking and reasoning. It is difficult to illustrate what I mean by this without going back and explaining just what an engineer is (or is supposed to be), but the general idea is that the mind must gradually be equipped with the "tools" by which engineering problems are solved. These tools are, of course a working knowledge of the laws of nature and the mathematical ability to apply these laws to specific problems.

Neither our knowledge of the laws of nature nor our development of applied mathematics have progressed to the point where all aeronautical engineering problems can be solved by throwing them into the hopper of a physical formula and turning the mathematical crank. Therefore the capable engineer must bridge gaps and supply missing links in the form of practical knowledge and experience. The second, or development, period in his training is largely concerned with this process. During this period he learns by doing; he profits by his mistakes (and the mistakes of others); he acquires a certain skill in applying theory to his particular field; he builds up a large background of useful information and improves his sense of proportion and judgment. Most of this development must occur after he leaves college. Why? Because modern engineering progress has been so rapid that no college can hope to do more than scratch the surface of an engineering field as new as aviation, at least when it comes to giving the student the latest practical information on the subject. Besides, great progress is being made in the research laboratories and shops of airplane and engine manufacturing companies and much of this information is kept secret, either for trade reasons or simply because no one has the time or inclination to publish it.

The gist of all the above discussion is simply this: it now takes a relatively long time to become a really valuable engineer, and most of this time has to be spent after the man enters the industry. In view of this, modern tendencies to lengthen the period of academic training might well be viewed with some alarm by potential engineers who regard their college training as an investment for future security and advancement.

All aspiring engineers should be graduated from high school with a much better scientific foundation. By that I don't mean that they should know more names for flora and fauna, or that they should have a broader smattering of knowledge on a multitude of pseudo-scientific subjects. But they should know the ABC's of engineering, namely, mathematics and physics. To attempt to become an engineer without a clear conception of mathematical processes and the laws of nature is like trying to play bridge without knowing the names of the cards or the rules of the game. And, strange as it may seem, the future engineer should be familiar with the English language!

In spite of all this we find a tendency to "ease up" still more on pure science in the high schools. This hardly seems fair to those boys who might have a natural ability along engineering lines, especially in view of the fact that this mechanical age offers an interesting and profitable future for good engineers. Even the layman can derive a lot of benefit and pleasure from a fair knowledge of engineering fundamentals, especially in these days when all the great engineering achievements are making front page headlines.

No doubt the high school situation is actually more serious than that of the colleges. But apparently very little is being done about it at present, except for a few pioneering attempts to "vitalize" the teaching of mathematics (Notably in the state of Washington). So let's look at the remaining part of the transition period in engineering education, the part taken over by the universities. Here the issue immediately becomes confused because of the fact that a college education has always stood for something in itself. It is therefore difficult to evaluate it as a straightforward means of improving one's chances for economic security. But if colleges are to offer their wares as a means of earning a living it seems only fair to suggest that the prospective purchaser should know how much he is going to pay for "culture" and how much for professional education.

The cost of a college education is measured in both money and time. Although money often appears at first to be the most important item, time may eventually turn out to be the major part of the price paid. The full realization of this fact comes to the engineer only after he has spent several years in the industry and finds that he is just beginning to be appreciated by his employers, financially speaking. There is nothing mysterious or unfair about this. It simply means that the engineer has been going through the development period of his education and that during this time he has continued to pay for it, in the form of reduced pay checks. Around this time, say eight to ten years after he started college, he begins to wonder whether there has not been too much contrast between the first and last halves of this post-high-school period. For four or five years he pursued a somewhat vague objective.

Then he was suddenly kicked out into the world of competition—through the Gothic doors of the University into the unadorned steel buildings of "the Company". He was probably lucky if he didn't have to take his turn in line at the employment manager's office. He found that it was taken for granted that he was through college; no one asked whether he had a diploma, what degrees he had acquired, or what electives he had taken. The big question was, what can you do for the company?

What can the graduate engineer do that he couldn't have done without his college education? Probably the best answer to this is that he can become a more valuable employee. He has acquired a mental foundation on which to build, he has learned how to use the engineer's methods of attack; he knows the most important rules of the game. But it will probably be years before he has developed sufficient skill in playing the game to bring his salary out of the lower brackets. His education has made it possible to do this, but it does not insure that he will do it. He is even likely to go backwards and forget much of what he learned in college.

When the realization of all this comes to the man four or five years out of college he begins to see what it cost him, in units of time, to acquire the means of advancement. He wonders whether it would not have been possible to dispense with a lot of the work he did in college; whether the long summer vacations were worth the year they set him back economically; whether the various broadening and cultural influences to which he subjected himself really made much difference five to ten years later. In short, he wonders whether a little streamlining might not have been a good thing for him, as well as for the airplane he is designing.

Two major questions inevitably arise in a discussion of this subject. One concerns the ability of any educational system to condense the fundamentals of engineering into a much shorter time than the classic four years (or the five or six favored by some institutions). The other is the inevitable question about the cultural value of college work. The first question is much easier to answer than the second. Some of the things that can be done to speed up the technical side of college education are quite obvious, such as eliminating non-technical subjects, cutting down on vacation periods, and adopting a full working day schedule. Among the less obvious methods that can be employed are specialization and revision of teaching methods.

Specialization, as used here, consists in shaping the entire curriculum so as to fit the aeronautical engineer. In a modern large airplane manufacturing plant we may find engineers numbered by the hundreds. In a certain sense they are all aeronautical engineers. But not in the sense adopted by the colleges. In the usual college course much time is spent on the theory of aerodynamics, much of which consists in classical methods of attack on idealized problems. But in an engineering department employing one hundred men how many are found working directly in aerodynamics? My guess would be between five and ten. Considering the hundreds of aeronautical engineering students enrolled in our colleges, it is probably safe to say that much more time is being spent today teaching aerodynamics than is spent using aerodynamics. By the same line of reasoning, we might suppose that more of aerodynamics is being forgotten in the factories than is being learned in the universities.

A clear conception of aerodynamic principles is useful and valuable to the engineer, but to obtain such a background is neither a difficult nor a time-consuming process. So there seems to be a chance here to cut down further on the academic period, provided that the student is willing to aim at the 90 to 95 per cent of the jobs not involving an advanced knowledge of aerodynamics. There will always be enough students specially interested in aerodynamics to fill the 5 to 10 per cent of the jobs requiring experts in that line.

The above case is a specific example of a general principle that could well be followed more closely by institutions of higher learning. It could be stated very simply as the practice of fitting the student for the kind of work he is most likely to get.

The speeding-up process can also be applied to methods of teaching, especially in the engineering field. We have found that progress in almost any subject can be greatly accelerated if the work can be given some point, preferably along the lines in which the student is most interested. This might be called "objective teaching", with the idea that there must be an object in sight at all times. There is a natural fear of the unknown in all people and especially in students entering a new field. The big words and Greek letters that highly educated professors love to use defeat their own purpose: they put the student on the defensive, instead of making him eager to learn more. A simple example from everyday life will often do wonders toward opening up the student's vision and his understanding of the laws of nature.

Along this same line, there seems to be something psychologically wrong with the classical methods of teaching mathematics and similar subjects. The math student first learns arithmetic, in which he deals with numbers and figures in a progressively complicated manner. Then he abruptly starts all over again with algebra, once more progressing from the simple to the complex. Finally he reaches that dread stage in his college career when he must undertake "The Calculus". Even this is split into two parts. If he goes beyond calculus he must start all over again in differential equations, and so on. Why must we thus classify and segregate our knowledge and give it to the student in separate doses? It seems almost like eating separately all the ingredients of a cake, instead of consuming the cake itself. If the student is introduced to the various branches of mathematics early in the game and permitted to be-

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By F. R. Shanley

Chief Engineer, Curtiss Wright Technical Institute

AVIATION'S readers are familiar with Mr. Shanley's technical writings. His recent articles on "Stress Ratios" and "Sheer Lag" are outstanding contributions to the art of stress analysis. Here, however, we find him in a new role. In his present position he has shifted his focus from engineering to the engineer. Required reading for engineers, would-be engineers, and employers of engineers.

SIMPLIFY Maintenance Through DESIGN

Operators feel that here is something that the factory should tackle, using operating experience of all air lines as a basis for the future design

By F. E. Nagle

Boston & Maine Airways

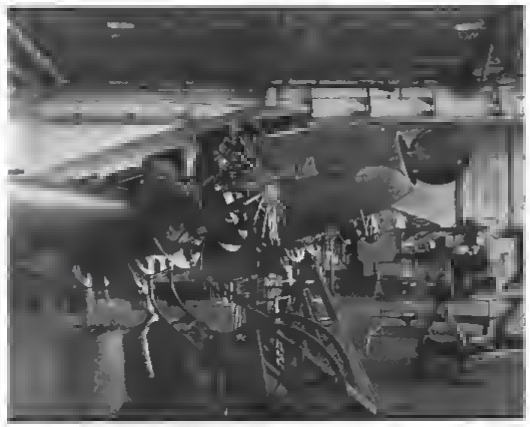
INASMUCH AS MAINTENANCE COSTS loom high in the airline budget it seems fitting that the thought of the designer should be placed on the problems of the smaller operator very early in the design. The smaller operator is faced with the necessity of cutting down on all service and overhaul functions, both from the need of using the equipment as much as possible, and the necessity of making a profit, which there is a slim chance of doing if a large maintenance staff is necessary to keep a few ships operating.

Airline operations demand ruggedness for all components, and while ruggedness generally means weight, it would be a great advantage if the factory and designers would allow for this at the start of construction. Eventually operations require the modification or strengthening of parts which prove unsatisfactory and while it is not possible in all cases to foresee what should be modified or strengthened at a later date, advantage should be taken of operating experiences and nothing adopted which is of questionable nature.

Every maintenance man who ever did aircraft work, has at one time or another wished he had the opportunity to be present when design was underway on the installation of a specific item of equipment, for in all too many cases much of the present day transports equipment is installed in such a position, as to eliminate the possibility of rapid or easy replacement or servicing. In too many instances it is necessary to remove several items before access to the item wanted is obtained, all of which costs money, either for the labor involved, or the withdrawal of the ship from active service while the work is being performed.

It is not thought possible that any manufacturer can build a ship that will obviate maintenance, no matter how well a ship is built, something has to wear out or require some manner of adjustment, so contentment will have to be with that ship which is so built as to facilitate maintenance. Facilitated maintenance would include proper grouping of all related objects, in such a manner that access to one of them does not demand removal of another or several. Individual items of equipment should if possible, be so mounted that their removal does not leave associated items hanging loosely, with possibility of adjustments having to be made on the reinstallation. All items should be capable of being removed from one position of the worker, without necessity of a helper unless weight or bulk demands it.

To systematize what a maintenance group believes should be incorporated in an ideal airplane of the light transport type we might take up the requirements in their approximate order, bearing in mind, that while many ships have most of the recommended features, few have enough to make them a perfect ship from the maintenance viewpoint.



Taking things in order, start in the pilot's compartment with the matter of proper windshield installation. Many designs leak both air and water, causing cold or wet cockpits depending on the weather. While it is no small matter to make a windshield and side window arrangement that will not leak at speeds around the two hundred fifty mile an hour mark, it has been done by many operators, with proper caulking, and slide or retainer arrangement. Caulking of the skin seams is a necessity to the front of the windshield for the high pressures will drive water under and along seams, spraying it into the cockpit. Glass sheets and panels should if at all possible be mounted in metal retainers outside the ship, and then the retainer screwed into place on the ship, with proper sealing. The shipping of glass sheets into place, and then holding them with screwed on strips, often causes broken panels, much time spent in sealing, and the possibility of breakage of the unframed sheet in stock.

Pulls on sliding windows are best if of the metal knob type, rather than glass squares cemented on, which soon fall off. Metal slides for the sliding windows should incorporate a type of drain that allows water collected to be sucked out so there is no tendency for it to seep down the walls of the cockpit, causing wetting of the soundproofing. The same applies to any point around the cockpit windows where there is a tendency for water to collect, and later be blown in.

All glass panel shapes should be standardized as to dimensions, to facilitate installation, and there should be little chance of cracking the glass on installation, if the mounts are so designed that there is no possibility of the glass being bent. As all know, glass won't bend, so it is still a wonder that some manufacturers fail to have absolutely flat mountings for glass panels, stiff enough to resist bending while installing the glass.

Provision is definitely needed for some means of reaching the windshield, in order to remove ice, that at times requires the use of a scraper. Then too, some provision should be made for pilot's vision during heavy rain, when the windshield is often opaque. Some sort of ample opening which will not admit wind and rain etc., is needed out of which the pilot can see to make a normal landing. Few ships have an opening of this sort that really works.

The mounting of accessories in the cockpit is something that should call for no little study. More time is lost changing instruments, hand fuel pumps gas valves, engine controls etc., than is gained through the use of detachable engine mounts, or other quick change features. Accessory installation in the cockpit, while necessarily a problem in view of the restricted space available, should receive ample consideration in design, with view to easy and fast maintenance operations. Installations should be made from a maintenance and operation standpoint, with appearance a secondary consideration. There is no need, in the majority of light transports to make such a compact arrangement of accessories in the cockpit, that one must remove multiple items, to reach and remove a faulty item of equipment. The smaller operator has no time to lay up ships for extensive overhaul, and generally keeps ships in top condition by running maintenance, all of which necessitates easy and speedy access to all items of equipment. Items which require adjustment or servicing such as brake master cylinders and linkage, engine controls, fuel valves, relief valves etc., are best so segregated that the removal of a gas selector valve does not require disconnecting controls around it, and if a brake master cylinder requires removal for servicing there should be no need to remove several gas lines around it to facilitate the removal. In nearly all instances, careful thought and planning, will allow the installation of cockpit controls and other equipment in positions which while still compact, will allow easy access for repairs, removal, or servicing.

Something of paramount importance to the maintenance man, but frequently forgotten by the builder, is the matter of successive installation of parts. In making installations the builder has a fairly easy time of it, due to the fact that he is constantly adding, and so has easy access to all items. The reverse is true insofar as maintenance is concerned, for in order to get at some item, the mechanic is frequently forced to remove many which being installed later, have to be pulled first to get at the item wanted. Take cockpit floors for example. Here in order to remove the flooring one popular transport demands the removal of the entire control assembly, multiple fuel and instrument lines, considerable upholstery, seats, and

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WHY **A PUBLIC RELATIONS PROGRAM** for INDUSTRY

AVIATION takes part this month in a joint program with all McGraw-Hill business papers to foster better public relations for all industry. The following editorial appears in all papers. On the pages that follow, a program for the aviation industries, and some basic facts and figures on aviation's contribution to America.

An Editorial Service to Meet

Industry's Major Problem

To the readers of AVIATION

THERE IS NO DOUBT that today the American people are taking a keener, more critical interest in the conduct of business than ever before. And when I say critical, I mean exactly that. During recent years most of them have suffered loss, either of jobs or of savings, and under such circumstances men are prone to accept without serious question any scapegoat that appears plausible. In the confusion of fears and resentments, they seem to have concluded that short sighted and selfish business management is chiefly responsible for their misfortune.

However mistaken and unfair such conclusions may be, management cannot ignore them. It must recognize that in the long run, the opinions of men are the result of experience, of what happens to them each day, much more than of what they are told.

Progressive management has already faced that fact, has already begun to think and work beyond the technicalities of production and distribution that once absorbed most of its energies. It sees more clearly and deals more proficiently with its human responsibilities. It is learning to reconcile the economic success of the industrial unit with the social welfare of worker and community.

Presently every business—the small retailer as well as the large manufacturer—must learn how to interpret more convincingly to its own public the social as well as the economic benefits of its policies and accomplishments. Only as each business satisfies the newly aroused and critical interest of people in its affairs will it be able to disarm those who trade on the human tendency to blame our troubles on someone else. Yes, if business as a whole is to win a favorable public opinion, each and every business must act to improve its own public relations.

The readers of this journal, and of other business publications, compose, we believe, a group that can achieve for American business a sound and lasting solution of this vital problem. They alone are in position to shape the working conditions of 21 million employees. They alone can mould the attitude of those other millions who compose the various "publics" to which all business must be responsible.

Heretofore, the function of business papers has been to exchange successful experience, to dig up and disseminate practical facts for the use of their readers, serving primarily the technical and merchandising needs of business. But this matter of human relations has now become of equal importance for good industrial and public relations, it has been found, reduces corporate losses, removes fear and suspicion, promotes operating efficiencies in both production and sales. A better knowledge of public relations technique is, therefore, quite properly essential for men in, or moving into, positions of greater executive responsibility.

So, beginning with this insert, each McGraw-Hill publication sets out to strengthen its editorial service in the important domain of Public Relations. I hope that the million readers of McGraw-Hill's business papers will get much real and practical help toward building better relationships between their own businesses and their employees, their customers, and the communities in which they must carry on.

James H. McGraw, Jr.

President,
McGraw-Hill Publishing Co., Inc.

IN LESS THAN TWO GENERATIONS the United States has changed from an agricultural to an industrial nation. Living standards and efficiencies at once the despair and envy of other countries have been created. Foreign delegations flock to our shores to study our methods so that they may use them as patterns for their own organizations. Yet here at home today these methods and the systems responsible for them are under increasing attack.

Since every person employed in productive enterprise is a part of American industry, these attacks imperil the livelihood of nearly forty million workers and their dependents. The newest addition to the payroll has as much—if not more—at stake as the veteran business executive. That also is true of particular industries which at present may not be under direct fire. All industry is so interrelated and interdependent that even the seemingly immune enterprise must suffer when the legitimate activities and the buying power of its customers, or the customers of its customers are curtailed.

Ironically enough, public acquiescence in many of the current attacks is an indirect recognition of the satisfactory manner in which our industrial system normally functions. Reasonable opportunities for the employment of those ambitious to put their mental or physical talents to work, and continually rising standards of living have come to be widely accepted as a matter of course. Any unfavorable change in these conditions leaves the general public surprised, confused and resentful. Such reactions as these make it easy for pressure groups to unloose destructive propaganda which further heightens resentments and breeds new misconceptions.

These misconceptions take many forms shaped by the experience, the inexperience, or the special interests of the critics. To one it appears that business can't manage itself and must be owned and managed by the Government. Another believes that employees are underpaid or that stockholders and executives are overpaid. To others corporate surpluses are too high. Many have convinced themselves that power and machines have reduced employment opportunities, and that industry can raise wages and reduce prices while costs go up.

Several misconceptions are based on faulty generalizations. Because a few companies have been remarkably successful, it is argued that all could make money. Because some corporations have been ruthless, all corporations, it is contended, will stoop to unethical conduct to gain their ends. This is like saying John Smith killed Bill Brown, John Smith is auburn-thatched, all redheads, therefore, are murderers. Unfortunately, those who would indict all business for the crimes of a few are more subtle in their approach and so create an impression not in accord with the facts.

To put it bluntly, American industry, once so highly praised for its contributions to the national well-being, is now on the spot. Prevailing misconceptions of how business operates and what it does have made a field day for those who propose to hamstring or destroy private initiative and individual opportunity. These proposals run a broad gamut. They include public ownership, increasing and rigid federal control at the expense of local autonomy, short-sighted legislation on hours and wages, labor dictatorships, and confiscatory taxes on thrift and employment security.

While the man in the street may be criticized for his willingness to swallow these nostrums, he is not wholly to blame. Industry, too, has been at fault, in assuming either that the public was being kept fully informed on those phases of its operations which are properly a matter of public interest. Some industrialists have even appeared to assume that a healthy public curiosity should be discouraged. Misconceptions multiply where the facts are hidden.

The tragedy of the situation lies in the fact that it might easily have been avoided. In the simple days of local and localized industry, everybody connected with a particular enterprise knew everybody else connected with it, and the details of its operations were an open book. The boss and the employees were neighbors, the customers, for the most part, fellow townsmen. Outside purchases were limited largely to those products which the local community neither manufactured nor raised.

As industry developed and enlarged its field of operations, much of this early intimate personal touch was lost. The small enterprise grew bigger. In some cases combinations took in the local business and financial control passed out of the community. The local industry which still retained its identity was busy meeting in-

creased competition and seeking to expand its distribution. Little attention was paid to changing conditions that were fostering misconceptions about the personal relations of the business. Bit by bit the close acquaintance and familiarity of the early days disappeared.

Common understanding of these things also was impeded by the greater variety of occupations as industry expanded. Each man's job became so highly specialized that the old feeling of common partnership in a joint undertaking frequently was lost. This made it easy for various occupational groups each to get the idea that its contribution to the undertaking alone was essential and that many of the other groups were parasitic or, at best, unimportant.

Such mistaken beliefs are the exclusive property of no particular group. "Goods are valueless until sold," chants the sales staff; "without us the wheels of industry would cease to turn." "The wheels would turn much faster," growls the production department, "if we didn't have so many lame-brains drawing fat salaries as salesmen." Under the cold glance of both groups, the clerical force heatedly inquires: "How long do you think this business would last if we didn't keep the cost records, send out bills and collect the money for pay checks?" Some executives and engineers, too, have been known to forget that their plans cannot be carried out without the cooperation of other groups.

Possibly the greatest single cause of misunderstanding and friction has been fuzzy thinking on social responsibilities. Many of the responsibilities which rested on the individual, the family, or the state in our fathers' and grandfathers' days have been shifted to the shoulders of industry. New ones constantly are added or proposed—often before industry has had time to adjust itself to those which have gone before. Some of these responsibilities affect employee relations; others involve customer relations. The worker, for example, no longer is completely defenseless against the occupational hazards of his employment. "Let the buyer beware" no longer is considered smart merchandising. Many of the changes now embodied in the laws were anticipated by industry itself. Opposition—valid or otherwise—to social legislation, however, has been used to damn business in the public eye.

Fortunately, the barriers to good will and common understanding can be broken down. The process is a simple one. It consists chiefly in maintaining good policies in human relationships and in keeping all interested people—employees, stockholders and their neighbors, customers and the general public—informed. It means telling them in plain terms what revenue is received and where it comes from, what revenue is paid out and who gets it, how an industry serves the individual, the community and other industries. Finally, it includes the acceptance of the social responsibilities which the advance of civilization imposes upon business.

Add all these things together and you have public relations.

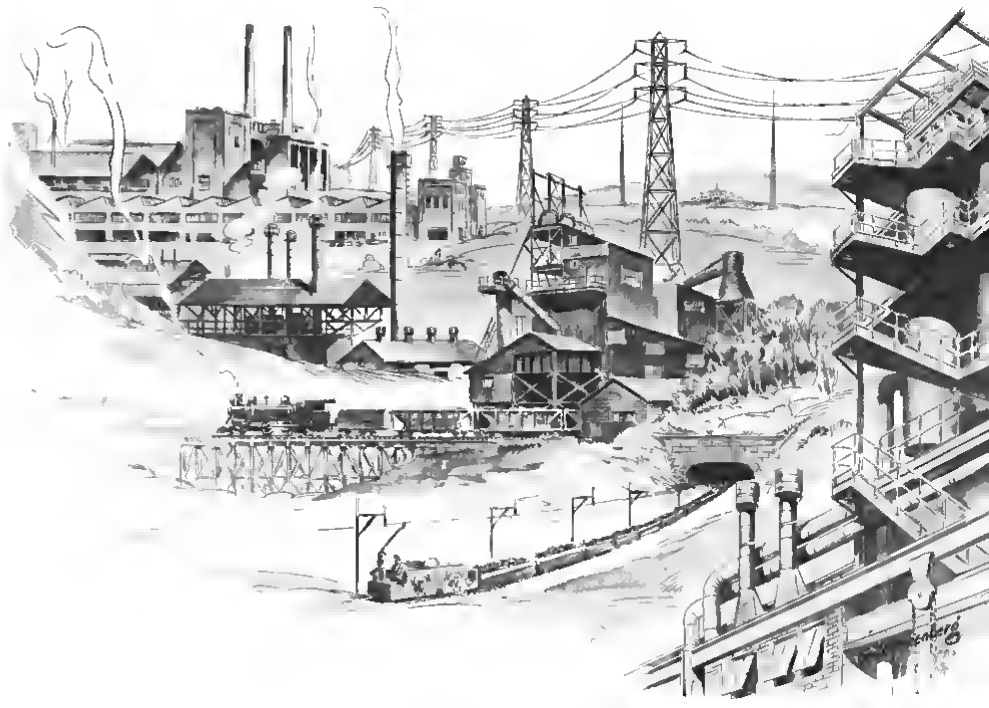
Most employers are willing to accept their social responsibilities, but they are inexpert in making that acceptance articulate. Too many employers have failed to make clear their policies, their practices and their purposes as they relate to fair dealing with employees, investors and the general public. Their intentions probably have been good, but they have cloaked them with a veil of secrecy and made a mystery out of simplicity. As a result the uninformed have been given a royal opportunity to exercise their imagination. And they have done it!

Public relations is a comparatively new activity for many business enterprises and involves principles and methods which too many have not yet learned. Obviously, the first place for each company to start is within its own organization. This is the "inside job" that builds a company's good reputation among its own family and lays the firm foundation for building the confidence and favor of those outside that family. As one exponent of the art phrases it: "Industry's public relations cannot be one thing and its private actions and policies something else. These two must be in complete accord."

The inside job should present no real difficulties to fair-minded employers. Most workers have a normal predisposition to view in a favorable light the organization in which they earn their livelihood. Most companies endeavor to conduct their operations so as to justify that favorable attitude. But too few of them are adept at dramatizing, or even telling, the facts that furnish a substantial basis for maintaining employee good will. So, where misunderstanding and suspicion born of ignorance exist, time may be required to break down the barriers that have grown up.

The second task, that of telling this inside job to the outside world, will not be easy, for two reasons. First, in many industries it has been so long neglected that the backlog of misunderstanding is large. Second, public relations involves attitudes as well as actions, a viewpoint as well as an organization. Public relations is not a commodity that can be purchased like a car of coal or a bolt of silk; neither can it be sold by "canned" material. Each program to establish sound public relations must be individualized and indisputably stamped with the personality of the company promoting it. *And the deed must always back the word!*

But the task is worth the effort. For, with the inside job right, a properly conceived and intelligently executed public relations program offers business the means of successfully counteracting unjust public suspicion, unfair political attack and unwarranted outside dictation.



A PROGRAM **for the** AVIATION INDUSTRIES

AVIATION HAS NEVER LACKED FOR PUBLICITY. For thirty years anything that has had to do with flying has been grist to the newspaper editor's mill. Successful aviation ventures always make headlines, unsuccessful ones are invariably paraded with banners.

What aviation has lacked, however, has been an adequate and rational program of public education. It is a curious fact that the very people who go goggle-eyed at the thought of stepping on board an airliner will, without turning a hair, put themselves in the hands of enthusiastic (and frequently inebriated) automobile-driving friends and barge cheerfully into crowded express highways at 60 miles an hour. Yet if they only knew it, their exposure to risk is much less flying from coast to coast on a transcontinental airliner than in such week-end jaunts to the seashore.

Clearly, somewhere somebody has missed the boat. In spite of all the money that has so far been poured into airline publicity, today not one citizen in ten thousand has any proper conception of what air transportation means to America, of its social implications, or of its potential importance to our national economy and to our national defense. Only a handful know anything of the millions of miles flown safely and surely every year, or of the tremendous strides that are being made every day toward safety, convenience and economy. What is needed to offset many of the misconceptions that exist in the public mind are FACTS, *properly presented*.

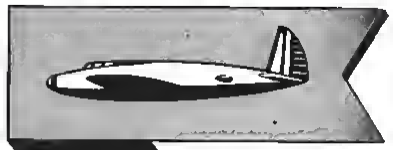
Air transport people know that they have got something that is vitally important, but are only beginning to realize that they must overhaul old ideas radically of how best to present the real facts to the press and to the public. Only recently some of the more foresighted of them have begun to utilize well planned, factual presentations instead of relying on the lure of movie celebrities draped over airplanes to attract customers. For years the railroads of the country jointly have been supporting campaigns to build into the popular mind the idea that rail travel is safe, comfortable and convenient. It has taken some airline people a long time to realize that they must go in for the same sort of cooperative, educational programs instead of trying to cut one another's throats by competitive advertising campaigns to achieve any worthwhile results. Collaboration rather than competition must keynote any adequate public relations program.

The same sort of reasoning can well be extended to those sections of the aviation industries outside of the transportation field, for, although the average citizen's chief contact with the industry is through the air lines, the time has come when quite literally this country's aviation has become everybody's business. Whether John Q. Citizen rides the airlines, charters a plane, writes an air mail letter, or simply pays his taxes, he has a vital stake in this industry, and as a contributor, should be in possession of all the facts about it.

And our manufacturing industries have reason enough to be proud of their contribution to the national welfare to publicize it properly. They are large employers of skilled labor. They buy huge quantities of materials that serve to keep other manufacturing industries alive. Their planes and engines and accessories turn up on every airway of the world as constant reminders of the excellence of all kinds of American-made goods in world markets. More important, in these times of world unrest and political upheaval, the products of our aeronautical industries supply the very bone and sinew of our national defense. But the man in the street is not generally aware of all this. He laps up the spectacular, the dramatic, and the thrilling misinformation dished out to him by the tabloids and misses the really important things that he should know about aviation.

So—the time seems well ripe for a serious overhauling of public relations programs of everyone in the business. Forget about old techniques (for obviously they haven't been entirely successful) and set to work on a new basis,—the presentation of basic FACTS to the public. Let us draw aside the veil of mystery and secrecy that has too often cloaked our activities. Aviation is fundamentally no different from other kinds of business. The public is entitled to facts, and can take them, and will respect them.

As a suggestion of the sort of things that should form the basis of a more adequate public relations program for the aviation industries AVIATION has assembled in the following pages a collection of facts and figures about certain phases of transport and manufacturing progress. For assistance in compiling this material we are indebted to Col. E. S. Gorrell and E. T. Paxton of the Air Transport Association of America, and to Leighton W. Rogers and Howard Mingos of the Aeronautical Chamber of Commerce.



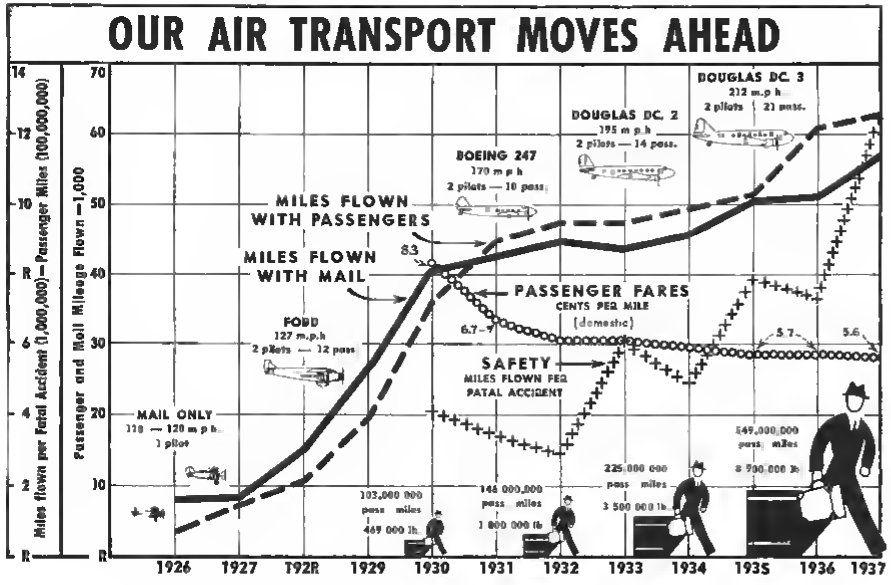
AIR TRANSPORTATION
Makes Its Contribution

SPEED is the essence of transportation by air In a little over a decade, air transportation has shrunk the United States from a strip of land some five days wide to a mere isthmus only fifteen hours across You may use a full business day in New York, board a luxurious sleeper plane at 5 P M., and arrive in Los Angeles or San Francisco the next morning with a full business day ahead It still takes better than 60 hours to cross by rail

SPEED WITH COMFORT is characteristic of modern air transport Ten years ago, if you flew at all, you flew in machines having the barest necessities of flight Very likely you sat on mail sacks in an open cockpit Today thousands of dollars are spent *in each airplane* for your comfort alone Ships are air conditioned, properly heated You sit in chairs or sleep in berths that cannot be matched for comfort in any other vehicle You are well fed (at no extra expense to you) You may smoke. You have the services of a well-trained stewardess or steward at your beck and call

SPEED WITH CONVENIENCE is the aim of all transport operators You find many schedules per day between key cities of the U.S where a few years ago there were but few For example, you may select any one of two dozen daily flights out of New York for Chicago instead of the half dozen available five years ago And where airports are located well away from downtown districts, you will find luxurious auto-busses to whisk you to your plane

SPEED WITH ECONOMY is the trend Ten years ago it cost you over 11 cents per mile for the doubtful airline



to our National Economy

accommodations of the period Today you ride in luxury and safety for just half that figure, and all indications point toward meeting rail competition on a straight fare-plus Pullman basis in the near future

SPEED WITH SAFETY is the watchword Thousands of dollars a year and the untiring effort of everyone in air transportation are directed toward safe operations. And the results have been remarkable, as a glance at an accompanying chart will show. Where in 1930 airlines flew 4,000,000 miles per fatal accident, last year the score went up over 12 000 000 miles, some 300 per cent!

AIR TRANSPORT'S ANNUAL PAYROLL IS $24,000,000

CLASSIFICATION		NUMBER	AVERAGE MONTHLY PAY
FLIGHT	PILOTS	(775)	$675
	COPILOTS	(613)	$230
	HOSTESSES STEWARDS	(443)	$115
GROUND — MECHANICAL	OVERHAUL AND MAINTENANCE CREWS	(3300)	$150
	FIELD AND HANGAR CREWS	(2500)	$90
GROUND — OPERATIONS	DISPATCHERS	(165)	$240
	STATION PERS.	(300)	$140
	METEOROLOGISTS	(90)	$175
	RADIO OPS.	(600)	$140
	TRAFFIC PERS.	(1600)	$130
	OFFICE PERS.	(1300)	$110
TOTALS	FLIGHT AND GROUND	11,750	Av. Monthly Payroll $2,000,000

INSURANCE COMPANIES are notoriously hard-boiled about accepting doubtful risks, and certainly no insurance company would consider it good business to underwrite any project for any reason that would not stand up under the most searching analysis of its actuaries. Yet (since January 1, 1938) you can lay 25 cents on the counter of any airline ticket office and receive therefor an insurance policy for $5,000 for the same length of journey, and on the same terms, that you have been accustomed to buy your trip insurance on U S railroads. When an insurance company is willing to bet 20,000 to 1 that you will complete your air journey in perfect safety, it goes without saying that they consider you, as an air traveller, a good risk.

AIR TRANSPORTATION is *potentially* the cheapest form of transport known to man. Air Transport is potentially the *safest* form of transport. No other form of transport has made such rapid strides toward economy and safety in such a short period of time.

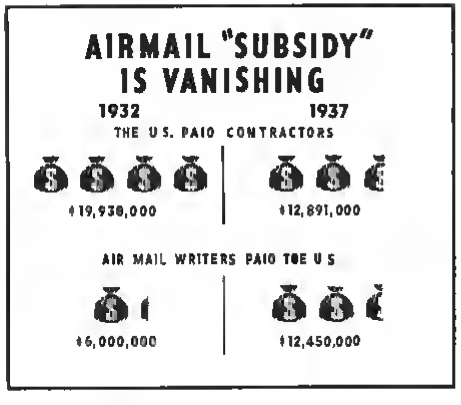
SATISFIED CUSTOMERS are the best guarantees of airline prosperity; satisfied employees are the best guarantee of airline safety. In no other field is the average of personnel intelligence and competence so high. In few other fields are the conditions of work so satisfactory. Who's who in air transport's annual $24,000,000 payroll is shown on an accompanying chart.

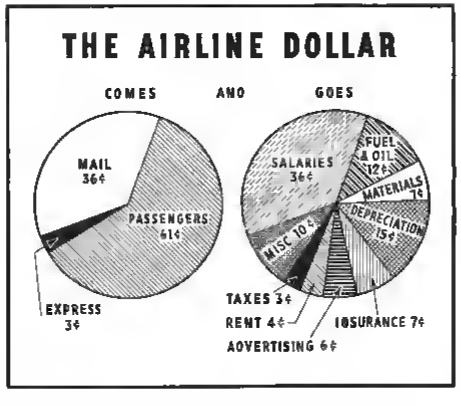
THE MATTER OF SUBSIDY is seldom understood by laymen. It is a popular notion that the government is pouring millions of dollars a year into the airlines in the form of fat mail contracts. They don't realize that the Post Office receives a big extra income from the sale of air mail stamps. Last year, by the most conservative estimate, this return came within $450,000 of the total amount paid out for the carriage of air mails. This year the difference will approach the vanishing point. Not much "subsidy" there!

MAIL PAYMENTS are becoming of less and less importance in the airline income statement as passenger and express revenues climb. Last year, only 36 per cent of air transport's income came from the Post Office. Incidentally and coincidentally, the percentage of the airline dollar that went into salaries and wages last year was also 36.

TECHNICAL ADVANCES in aircraft and in aircraft accessories have been astounding. Where the airplane of a decade ago still suffered from the stick and wire complex of the World War period, today's airliners are sturdy structures of new and stronger alloys of aluminum and steel. Engine designers also have achieved remarkable results with new and better materials. Today's power plants are capable of producing almost double the horsepower per cubic inch of displacement as compared with engines of ten years ago. And they have become so reliable, in spite of increasing complication, that engine failures in flight are almost unknown today.

MAINTENANCE of aircraft and engines has reached an extraordinarily high degree of perfection. Even the most minute item of every airliner is inspected carefully at the end of each day's run and periodically each plane is withdrawn from service and given a complete overhauling. Engines, propellers, accessories, and radios are removed from ships at short intervals and are completely rebuilt to conform to original manufacturing specifications. No expense is spared to keep our airline flying equipment in the best possible mechanical condition. As a matter of routine, airline aircraft and their power plants and accessory equipment constitute the best maintained group of transportation equipment to be found in any sort of transport activity anywhere in the world.





AIRCRAFT MANUFACTURING

—An increasingly important element in the U. S. industrial picture.—the backbone of our national air defence.

MORE THAN 60,000 AIRPLANES have been built in the United States since the Wright brothers—inventors of the airplane—set up the first factory in 1909. During these 30 years aircraft manufacturing has developed into a great industry. It produced 1,641 airplanes and 3,051 engines during the first six months of 1938. With spare parts this airplane and engine production was valued at $72,275,383.

OF THE $72,275,383 in value of aircraft, engines and spare parts produced during the first six months of 1938, the shop workers received in wages more than $30,000,000.

THE SHOP WORKERS alone receive 44 cents of every dollar of revenue. The remaining 56 cents is apportioned among all other expenses, office and other workers, management, raw materials, fabricated materials, tools, plant upkeep and repairs, sales promotion, research and development, taxes and depreciation, and profits, if any.

THE AIRCRAFT MANUFACTURING INDUSTRY depends upon four different markets—the air transport lines, private flying, national defense and exports. All are important to Americans. The air lines speed up transportation. Private flying, like the motor car, is useful for many different purposes in business, industry, sport and pleasure. Maintenance of an adequate air defense is our best insurance against attack and a potent agency for peace. Exports of American aircraft products help to defray the cost of expensive research and development and at the same time assist in keeping men at work in our factories.

APPROXIMATELY 44 PER CENT of the American aircraft industry's business is export trade to nearly every country on earth. With 36,000 employees in the industry our export trade alone gave employment to about 15,000.

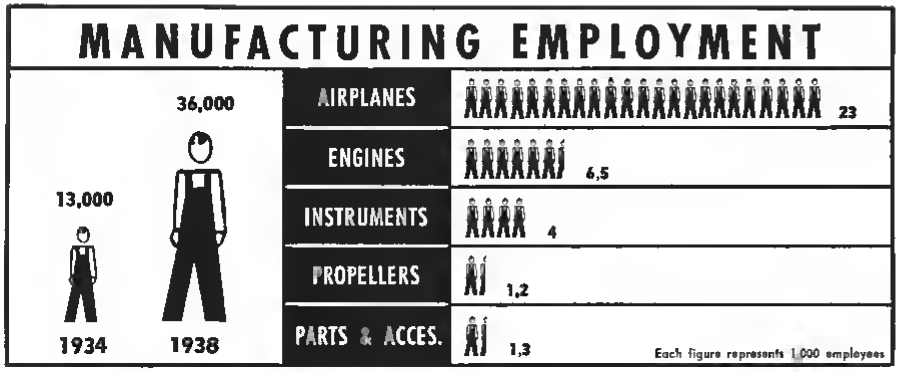
DURING THE FIRST SIX MONTHS of 1938 we exported $24,000,000 worth of airplanes and airplane engines. Wages to shop labor from this export trade alone amounted to more than $10,000,000, an annual rate of more than twenty million dollars in shop wages from sales of planes and engines abroad. All this export business was carried on under licenses from the Government in accordance with the United States neutrality law.

OUR AIRCRAFT INDUSTRY started to develop its export markets at the suggestion of the Wilson Administration which realized that European nations were developing an aircraft export trade in order to strengthen their own industries. European Governments have tried to use export trade to expand their industries so that they will have reservoirs of equipment in an emergency. Today England, France, Germany, Italy and Russia are competing most aggressively for sales of aircraft in South America, Southeast Europe and Asia. England, for example, exported 608 airplanes as compared to 629 from the United States during the last 12 months of record.

THE AMERICAN AIRCRAFT INDUSTRY has been built up by the investment of private capital and private inventive ingenuity. It has never paid liberal dividends because a large percentage of revenues has been devoted to research and engineering development, the improvement of the flying machine. That is one of the reasons for the superiority of American aircraft.

THE AIRCRAFT PLANTS are limited in profits on military contracts, so they must depend on commercial and export sales to defray the cost of a great deal of their overhead, plant maintenance, development costs and reasonably steady payrolls.

THE AVERAGE PROFIT on production contracts for Naval aircraft between 1927 and 1933 was 8.0 per cent; the average loss on experimental contracts, 34 per cent. Between 1934 and 1936 the average profit on production



orders fell to 2.8 per cent, the average loss on experimental work rising to 71 per cent. These figures came to light in the testimony of Rear Admiral Arthur B. Cook, Chief of the Naval Bureau of Aeronautics before a House Naval Affairs Sub-Committee.

A BIDDER FOR AN AIR CORPS CONTRACT must actually submit a finished airplane with his price schedule. Some of these cost up to a million dollars to develop. Its sponsor may not receive a contract and he holds the bag for development cost. The Navy's selection of an airplane comes after a design competition. This method of procurement is somewhat less of a gamble. But the Navy limits profits to 10 per cent under the Vinson Act, and builds 10 per cent of its equipment in a government operated factory at Philadelphia Navy Yard.

THE AVERAGE ANNUAL WAGE for shop workers in our airplane plants is $1,550. This figure shows that aircraft manufacturing pays annual wages comparable to those in other industries.

APPROXIMATELY ONE-THIRD of the labor now employed in aircraft manufacturing has entered the industry within the last three years. The remaining two-thirds, about 24,000 employees, have entered the industry as it developed year by year. In 1934 the industry employed only 13,000 factory workers. On January 1, 1938, the total was 36,000.

NEARLY 1,000 PLANES for private, commercial industrial and sport uses were built and sold by American manufacturers during the first six months of 1938.

THE AIRCRAFT INDUSTRY is growing steadily. In 1927 the value of total production of planes, engines and parts was less than $26,000,000. Ten years later, in 1937, it was approximately $115,000,000. During the first six months of 1938 that production was more than $72,000,000, and the estimated total for the full year of 1938 is $165,000,000.

WORKING AT FULL CAPACITY, the American aircraft industry could employ approximately 74,000 men without expansion of plant facilities. That number of course does not include the vast number of additional workers who would be employed in the allied industries contributing to the manufacture of aircraft.

PATENT APPLICATIONS ON INVENTIONS to improve aircraft average three every day in the year. Besides that there are hundreds of non-patented inventions and improvements produced by the industry every year. The manufacturing companies spend millions of dollars annually on projects for improvement of American planes, engines and auxiliaries.

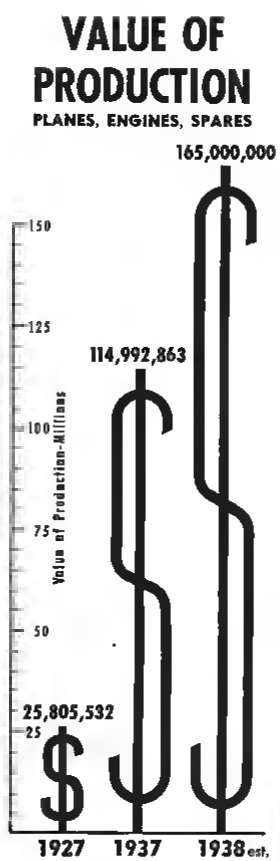
AMERICAN AIRCRAFT for years have been models for the rest of the world to imitate. So the research work of the U. S. National Advisory Committee for Aeronautics is the model on which foreign Governments base their scientific development programs.

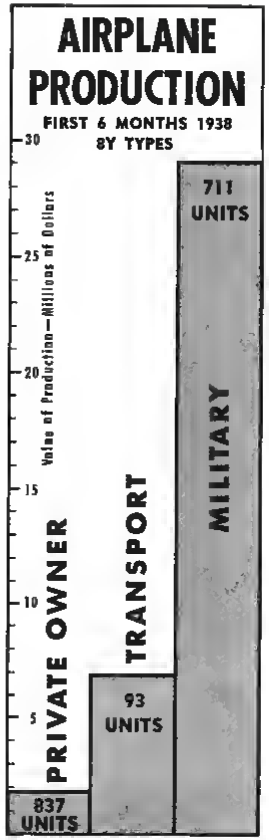
NEARLY 1,000 COMPANIES supply raw and fabricated materials, parts and instruments for the manufacture of a completed airplane. These members of the allied industries are located in every State.

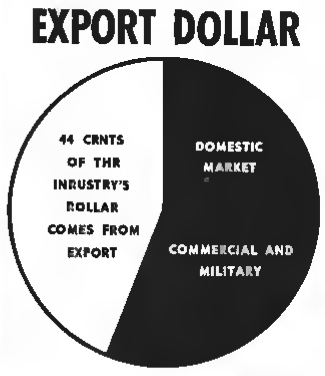
APPROXIMATELY 40 TYPES and models of aircraft built in the United States, are available for civil use, air transport, business and private flying. They range from planes carrying two persons to huge transports carrying at least 40 passengers. More than 10,000 airplanes are in civil use in the United States at the present time. Seventy different kinds of business and industrial organizations operate their own airplanes in company business.

MANUFACTURERS have made available to the airlines in recent months, such outstanding equipment as the Douglas DC-4 40 passenger airliner, the Stratoliner by Boeing which is nearly as large, and the Boeing 314 Flying Boat for transoceanic service. These ships are outstanding in performance and will be in actual service in the next few months. They have been developed without a single dollar of government subsidy. Approximately ten other advanced designs are in process of development today under the same conditions.

PRIVATE AIRPLANE PRODUCTION this year should approximate that of 1937 in numbers,—a remarkable accomplishment in the light of the depressed business conditions which are the determining factor in airplane sales to the private owner. Production and distribution facilities for this type of equipment are constantly improving and any improvement in general business will be reflected immediately in this market. An equally important result will be the consequent increase in employment throughout the aviation and allied industries.

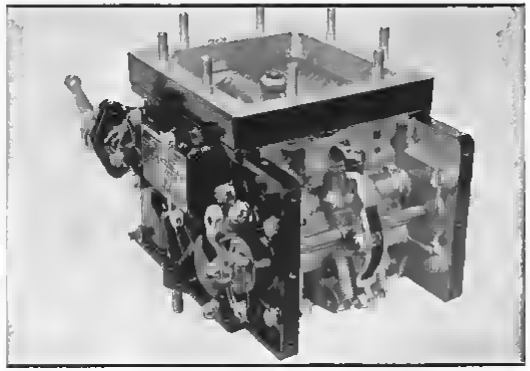






Flying Equipment

Reduces Ice Hazard and Provides Automatic Mixture Compensation



The cam mechanism which regulates fuel flow

CARBURETOR
By Chandler Groves

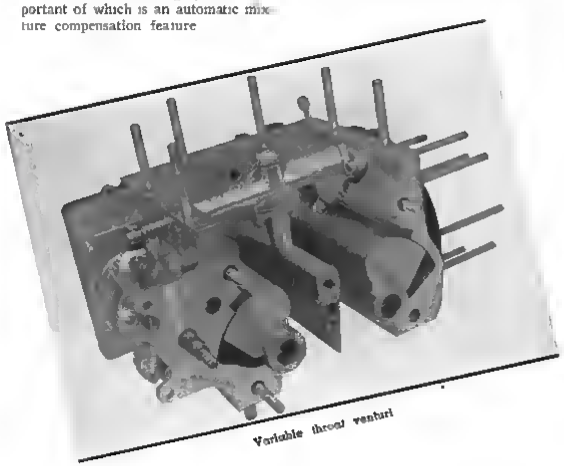
AMONG THE RECENT RELEASES of military equipment for export are two important adjuncts to Wright engines. One is the Chandler Groves carburetor, the other the Wright two speed supercharger.

Mentioned first in AVIATION's May 1936 issue, the Chandler Groves carburetor has been in use by the U. S. Navy for several years. It was designed primarily to reduce the hazard of carburetor icing, but possesses several other advantages, most important of which is an automatic mixture compensation feature.

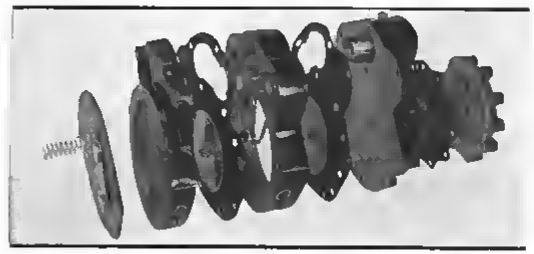
In the Chandler Groves carburetor butterfly valves and all obstructions on which ice could accumulate have been eliminated below the point where the fuel is introduced in the single large variable venturi. Two of the four walls of this rectangular venturi form the adjustable valve which regulates the flow of air through the carburetor. Fuel enters at a point where vaporization takes place in the adapter which is unrestricted in section. Instead of the usual float valve, a chamber with two diaphragms in the side walls is used to control fuel flow which is cut off when pressure on the diaphragm reaches a certain point. The chamber is always full and metering takes place regardless of the altitude of the airplane.

Completely automatic mixture compensation is provided in a simple manner but an additional manual control is provided to insure maximum economy and to provide an effective fuel shut-off. An automatic accelerating pump also is provided. It consists of a chamber divided by a diaphragm. Fuel enters one side through a one-way valve. Its discharge is a nozzle in the carburetor air passage. The other side of the chamber is open to the vacuum below the carburetor when the throttle is partly closed. When idling the vacuum draws the diaphragm against three springs in the vacuum chamber and draws fuel into the other side. Sudden opening of the throttle breaks the vacuum and the pressure of the springs against the diaphragm discharge fuel from the nozzle. Provision is also made to enrich the mixture automatically at higher outputs. Fuel flow through a venturi at the carburetor entrance creates a pressure differential between the entrance and the venturi throat. This operates a spring-loaded needle valve. Continued increase in fuel flow eventually creates sufficient pressure to open the needle valve which controls a separate fuel jet.

The carburetor is simple in design and easy to service. It is built up in several sections to eliminate complicated castings.



Variable throat venturi



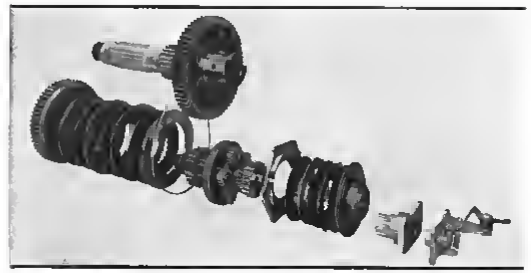
Replacing the usual float chamber is a diaphragm mechanism which functions regardless of the plane's altitude

SUPERCHARGER
By Wright

Two Degrees of Boost From a Single Unit

Designed in cooperation with Air Corps engineers, the two-speed supercharger provides two degrees of supercharging—one for full power, sea level take-off and the second for higher altitudes. Mechanically it consists of a small set of planetary reduction gears in the supercharger drive train that can be actuated by the pilot to reduce blower speed or can be by-passed so the supercharger runs at high speed. The unit, which is only 6½ in. in diameter, 9 in. long and weighs only a few pounds, replaces a solid lay-shaft or the intermediate supercharger drive shaft between the engine drive and impeller. Besides the reduction gears, the unit includes two multiple-plate clutches operated by engine oil pressure. Oil is diverted from one to the other by a selector valve in the cockpit. Clutches are disengaged by springs when no pressure is exerted on them, so that when one is operating the other is not. When the front clutch is engaged the unit is locked into a rigid shaft giving the higher blower ratio. For take off, however, the oil pressure is directed to the rear clutch, the planetary gearing functions, and a lower impeller speed results.

All modern Cyclones are designed for the two speed unit. Usual ratios (for F-55, F-65, G-5, and G-105A) are 7.14:1 and 10:1. For the G-108A ratios of 8.31:1 and 10:1 are provided.



Supercharged mechanism showing clutch plates and planetary gears

Window Shopping

The following literature, available direct from the firms listed, provides information of value to various branches of the aviation industry.

ACHESON COLLOIDS CORPORATION
Port Huron, Michigan.

Technical Bulletins—A complete series of informative bulletins giving valuable information on the qualities and application of 'Oildag' in connection with lubrication problems.

BAKELITE CORPORATION
247 Park Avenue,
New York, N. Y.

Bakelite Rainbow-Hued Materials—A folder announcing new brilliantly colored thermoplastic compounds of gem-like color.

CONTINENTAL MACHINE SPECIALTIES
Minneapolis, Minn.

Do-All Folder—A new eight-page folder describing the latest Do-All equipment, for band sawing and filing.

MAGNUS CHEMICAL COMPANY, INC.
Garwood, N. J.

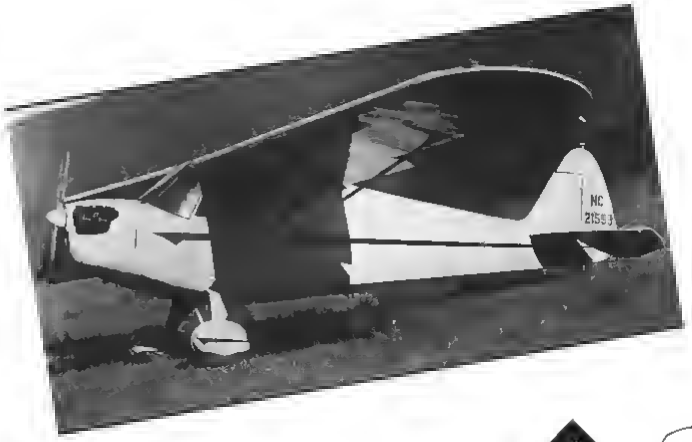
Magnus Cement Cleaner—A folder describing in detail a material and method for cleaning and hardening concrete floors.

RUBBER CHEMICALS DIVISION,
E. I. DU PONT DE NEMOURS & CO. INC.,
Wilmington, Delaware

The Neoprene Notebook—A publication appearing monthly which should prove invaluable to everyone working with rubber or synthetic rubber for difficult applications.

NIAGRA MACHINE AND TOOL WORKS,
637 Northland Ave.,
Buffalo, N. Y.

Bulletin No. 59-D—Describes the Niagra bench type power press No. 101 which is said to be especially applicable to the aviation manufacturer's needs.



Flying Equipment

Side-by-Side CUB

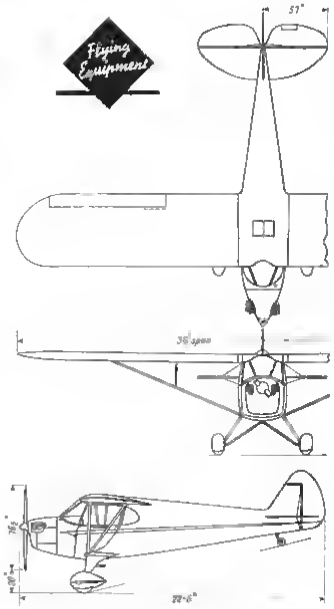
New Coupe Designed for Sportsman Pilot

THE long awaited side-by-side Cub made its first appearance at the National Air Races and will be available for deliveries this month. The new Cub Coupe marks a new high in interior fittings and finish and is intended for the sportsman pilot who seeks more luxury than that of the Trainer or Sport models in the low priced class. Standard equipment includes fully upholstered cabin with two entrance doors, carpeted floor and deep leather upholstery, as well as battery, navigation lights, compass, airspeed indicator, brakes, oleo landing gear, and wheel pants. Stick control has been retained but the control sticks are located far forward and curved to provide knee clearance. Brakes are on the left side. All controls are removable. Power plant is the 50 hp. Continental.

The cabin will appeal to the sportsman, with no pulley or linkage systems visible, a 22"x40"x14" baggage compartment, and a 42" wide seat. Unusually good visability is provided by windows extending far back and skylight with rear-view mirror. An ignition key rather than the usual ignition switch is installed on the automobile type instrument panel and a dial type gas-gauge is included in the equipment.

The standard Cub wing section has been retained to keep the familiar high-lift qualities, but the wing has been "beefed up" by addition of two extra ribs and swaged drag and anti-drag wires to give additional strength for the greater gross load. Balanced rudder and ailerons are provided, and a 10 degree differential has been built into the ailerons for more positive control. Immediate reaction on the elevator tab is provided by the Arens control.

The landing gear has oleo shock absorbers, Hayes brakes, airwheels, and a full swivel tailwheel with a self-aligning spring to prevent oscillation.



CESSNA Airmaster for 1939

143 m.p.h. Cruising speed and automobile fuel economy combined in new ship

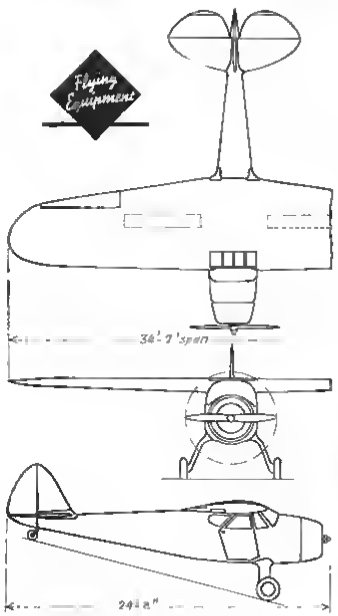
INTRODUCED early in September the 1939 Cessna Airmaster is now available for delivery. The latest Airmaster is capable of cruising with four passengers at 143 m.p.h. at sea level, taking but 75 per cent power out of the 145 hp. Warner Super Scarab. Gasoline mileage of 15 per gallon compares with that of the average automobile. The clean lines and excellent finish characteristic of Cessna design and construction are noteworthy.

The fuselage structure is of chrome molybdenum steel tubing and all fairing is fastened in place by steel lugs on the structure, thus eliminating any possibility of the fairing being pulled from place when the fabric is applied. The forward portion of the fuselage aft to the landing gear is aluminum alloy covered. The entire structure is sea plane corrosion-proofed, which is of extreme value to the owner, in that he can equip the airplane with floats without further preparation.

Characteristically Cessna the wings is of full cantilever construction. The structure of the fabric covered cantilever wing consists of two solid laminated spruce spars which are rigidly braced in torsion with deep drag trusses and double drag wire bracing. The leading edge of the wing and tips are plywood covered. The basic airfoil section is the NACA 2412 and the wing is tapered both in thickness and plan form throughout its entire span. The ailerons are hinged on self-aligning Fafnir bearings and are statically and dynamically balanced, resulting in their being smooth and effective in operation. An aluminum alloy constructed, split type wing flap of a very practical design is located between the aileron and fuselage just forward of the rear spar. Actuated electrically, the flap stops itself automatically in full extended position or can be lowered to any increment of this position at the will of the pilot by merely controlling the switch which is conveniently located on the left side of the instrument panel. Inducing added lift and amply sufficient drag, the flap possesses the desirable characteristic of not altering the longitudinal trim of the airplane when extended.

The entire tail group is also full cantilever, the fin and stabilizer having spruce spars of rugged dimensions, the leading edge and tips of both being covered by plywood. The ele

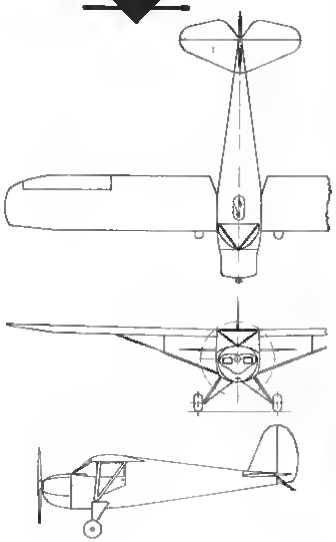
(Turn to page 45)



Cabin and landing gear details for Cessna Airmaster.

Luscombe's LIGHT PLANE

Fifty Horsepower All-Metal Model Sells for $1895



IMPORTANT contender for the low priced light plane market is the new Luscombe "Fifty" which has just received its approved type certificate and is priced at $1895 with Continental A-50 engine. Like other Luscombe models the Fifty is of all metal monocoque construction with full cantilever tail group. Extensive use is made of die-cut parts for simplified production and ease of replacement. Two unobstructed entrance doors are provided to the 39-inch cabin and the side-by-side seating arrangement is used. Airspeed indicator, altimeter and engine instruments are standard. Extra equipment includes dual ignition, starter generator, tail wheel and lights. Fuel capacity of 14 gallons gives a range of 400 miles.

Landing gear is semi-cantilever with a 73 inch tread and fully enclosed oildraulic shock unit.

Specifications furnished by the manufacturer are as follows:

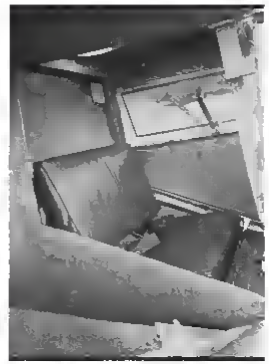
Span	35 ft.
Length	20 ft. 7 in.
Height	5 ft. 6 in.
Weight empty	620 lb.
Gross weight	1130 lb.
Wing loading	8.07 lb. per sq. ft.
Power loading	22.60 lb. per hp.
Maximum speed	103 m.p.h.
Cruising speed	94 m.p.h.
Landing speed	37 m.p.h.
Rate of climb	750 ft. per min.
Ceiling	13,500 ft.

Large air scoops and onto-type hinging and latches on cowling.

Luscombe instrument board is simple and clean, with a Stewart-Warner combination tachometer - pressure - temperature instrument in the center.

Interesting treatment of wing root and cabin fairing.

Metal tail surfaces are light and rigid.



Convenient luggage space concealed behind seat of Luscombe 50.

Airmaster

(Continued from page 42)

vators and rudder have steel structure the rudder being actuated by cables and the elevator by a push-pull tube. Fafnir ball bearings are utilized at all principal points throughout the control system.

Vision for both pilot and passengers is extremely good as the molded Plexiglass windshield is unobstructed by structural members through an entire 180 deg. and the windows have been curved to allow maximum vision through the sides of the cabin. The control columns are conveniently located with dual controls being installed as standard equipment. Laidlaw upholstering and molded rubber cushions give the cabin a neat, tailored appearance. Four cabin ventilators keep the cabin at comfortable temperatures and all are easily adjustable by the pilot when the plane is in flight.

The tread of the cantilever landing gear is 87 inches, insuring good ground characteristics. Included in the regular equipment of the airplane are Goodyear 7.50x10 hydraulic brakes. These wheels are fitted with 6.50x10 tire equipment. A tapered metering pin used in the oleo of the landing gear provides a variable rate of oil flow, allowing it to work at the highest possible degree of efficiency in dissipating the landing shock. Full spring action for the entire 6-in. oleo travel insures a fully extended strut on every landing. Ground handling is further aided by the use of a tail wheel lock which consists of a spring mounted pin which holds the tail wheel in fore and aft position until the pilot disengages the pin for taxiing, at which time the unit becomes full swiveling through 360 deg. Binding is eliminated when the tail wheel swivels through the unique mounting of a thrust bearing between the oleo taxiing spring and the top of the oleo barrel.

The 145 hp. Warner Super Scarab is mounted on a detachable engine mount which is suspended at the one piece stainless steel firewall with Lord rubber bushings. All engine controls are Arens locking type push-pull units. Tankage is provided for 35 gallons of fuel in the standard arrangement but auxiliary provisions have been arranged so that either 45 gallons or 52½ gallons can be carried. An electrically operated gasoline gauge accurately indicates the gasoline on board at all times.

Specifications and performance figures furnished by the manufacturer are as follows:

Wing span	34 ft. 2 in.
Overall length	24 ft. 8 in.
Overall height	7 ft.
Wing area	181 sq. ft.
Empty weight	1380 lb.
Gross weight	2350 lb.
Wing loading	13 lb./sq. ft.
Power loading	16.2 lb./hp.
Maximum speed, at sea level	162 m.p.h.
Cruising speed, 75% power optimum altitude (8200 ft.)	151 m.p.h.
Cruising speed, 75% power at sea level	143 m.p.h.
Landing speed	49 m.p.h.
Rate of climb	1000 ft. first min.
Service ceiling	18000 ft.
Cruising range	525-785 miles

AERONCA Chief

Higher Performance and More Luxury in 1939 Model

AERONCA'S NEW POLICY of announcing new models in the fall rather than in the spring provides us with details of the new Chief for 1939, designated the Model 50-C. In addition to the improved finish, inside and out a substantial increase in performance is claimed with cruising speed set at 90 m.p.h. and top speed 100 m.p.h.

The fuselage is well rounded to give better streamlining and more graceful proportions, and is much deeper at the cabin, which gives increased head room. The cabin is also four and one-half inches wider than last year's model, which gives increased leg room and adds to the comfort of pilot and passenger considerably. The doors are wide and have a slight curvature to further increase the roominess of the cabin, and the pyralin windows are of the sliding type, adjustable in any position, which permits no draft ventilation. The sloping windshield of the same material is made in one piece, giving maximum visibility. Special care has been given to the interior appointments of the new Chief. The cabin is completely upholstered to give it the appearance of the modern automobile interior. The seats are deeper and more comfortable, and are of molded paratex serviceably upholstered in tufted morocco leatherette in shades to harmonize with the exterior colors. In the de luxe models cushions are upholstered in matching shades of mohair fabric, with a light shade upholstery on the cabin roof, with beading to match the cushions.

Flight instruments are centrally located on a broad curving panel which is designed to accommodate additional instruments, and the panel is handsomely finished in crackled lacquer to match the interior color scheme.

An ultra-modern streamline cowling houses the complete motor (with the exception of the exhaust stacks, which extend through the bottom section of the cowling). Aerodynamic characteristics are improved greatly by the streamlining of the cowling, and the cooling, which is accomplished by vertical louvres is likewise improved considerably.

A twelve-gallon aluminum fuel tank is located forward of the instrument panel, and carries two gallons more than last year's model, and four gallons more than the earlier C3 model. Additional fuel may be carried in the five-gallon auxiliary gas tank which is accessible for refueling from the outside, and which permits increased cruising range.

Landing gear is the "dual action" oleo tripod type. Working in conjunction with a heavy helical spring. As the fluid is forced through a small orifice in the piston, part of the oil is by-passed into the outer chamber of the gear and this serves to cushion the rebound as the oleo strut is returned to the fully extended position by the spring. Firestone low pressure tires and Shinn hubs are used. Shinn mechanical brakes are available as extra equipment, as is the pneumatic tail wheel assembly. The adjustable brakes are operated by heel plates.

The fuselage structure consists of four chrome-molybdenum longerons to the first bay aft of the cabin and three longeron construction from this bay to the rear. The fuselage is faired smoothly by means of plywood, bulkheads and spruce stringers. This year's models have additional fairing stringers. The result is an extremely graceful streamlined fuselage which tapers smoothly into the integral fin. The fuselage is aluminum covered aft.

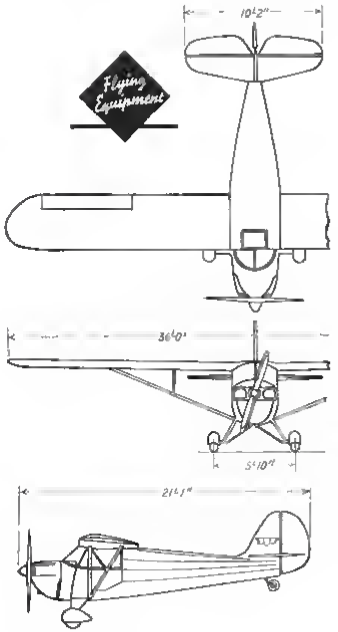
The externally braced tail surfaces are made up of steel channel ribs and trailing edge, welded to a tubular leading edge spar. On the left elevator there is an adjustable trimming tab.

The wings are of conventional two spar design.

This model Aeronca was approved August 11th, and is now in production. Although there are a great many improvements on this 1939 model, the prices remain the same as on last year's models, this particular model listing at $1,795.00 and up.

The specifications and performance figures furnished by the manufacturer:

Wing span	36 ft.
Length	21 ft.
Height	6 ft. 7 in.
Empty weight—(lb.)	650
Gas (12 gallons)—(lb.)	72
Oil (4 quarts)—(lb.)	8
Pilot—(lb.)	170
Passenger—(lb.)	170
Baggage—(lb.)	40
Miscellaneous equipment	20
Useful load—(lb.)	480
Gross weight—(lb.)	1,130
Wing loading—lb. per sq. ft.	6.68
Power loading—lb. per hp.	22.6
High speed	100 m.p.h.
Cruising speed	90 m.p.h.
Landing speed	32 m.p.h.
Rate of climb	550 ft. first minute
Gliding angle	10 to 1
Service ceiling	14,000 ft.
Cruising range	250 miles



AVIATION

RADIO

Dialing the Air Waves with Don Fink

Facsimile Tests

Finch Labs acquire plane to continue experiments

WORD HAS BEEN RECEIVED of the purchase of a single-motored monoplane by the Finch Telecommunications Laboratory, for use at the Bendix Airport in testing radio facsimile transmissions from ground to plane. Previous tests have shown the feasibility of transmissions of this kind, and the possibility of transmitting weather maps, military information, etc., to the plane directly in visual form has lent great interest to the project.

The Finch facsimile transmission system has been tested for some months at station WOR, in Newark, during the early morning hours (2:00 to 3:00 A. M.) on their regular frequency of 710 kc. The transmitter contains a drum on which is wrapped the photograph or printed matter to be transmitted. A phototube is then caused to "scan" the photograph in a series of parallel lines, one after the other. The phototube converts the variations of light and shade along each line into corresponding variations in electric current. This "picture signal" is then used to modulate a carrier frequency of 2000 cycles, which in turn modulates the carrier of the broadcast station. At the beginning of each line a synchronizing signal, on 4000 cycles, is sent out.

A conventional receiver is used for reception. In the output stage of the receiver, a connection is made to the facsimile unit. The receiver contains a roll of specially prepared paper, having a red surface. The paper is caused to pass, by means of a motor drive, in front of a stylus which swings from one edge of the paper to the other, tracing out the individual lines in the image. The modulated voltage derived from the output stage is demodulated and applied directly between the stylus point and the frame of the machine. The voltage causes a small current to pass from the stylus through the prepared paper to the frame. The current causes the red coating to change to black, and the amount of change depends on the voltage applied. In consequence, each line of the image is reproduced in black and red on the paper. Each swing of the stylus is initiated by the synchronizing pulse derived from the received signal.

All sorts of printed and photographic matter may be transmitted by the system, and the detail of the reproduction is sufficiently fine to reproduce fine newspaper type. For aircraft use, special experimental frequencies are used, rather than broadcast frequencies, but otherwise the technique is the same. The facsimile unit weighs about 20 pounds but weight may be reduced for aircraft.

Portable Station

Lear announces gasoline-powered 250-watt unit

A COMPLETE PORTABLE RADIO STATION, suitable for use in connection with aircraft, has been developed and recently announced by Lear Radio of Roosevelt Field, N. Y. The station consists of two units, a gasoline-driven generator, weighing 65 lbs., complete in carrying case, and a transmitter receiver unit, weighing 67 pounds, mounted in a similar case. The gas generator consumes about one-half pint of gasoline per hour, and delivers a maximum output of 250 watts at 12 volts. A storage battery may be used to "float" across the line, but is not necessary since a voltage regulation of better than 5 per cent is obtained from a double-compound winding.

The transmitter operates on any of three fixed frequencies: 375 kc, 2895 kc and 5780 kc. The transmitter is off, the receiver on, at all times except when the microphone button or key is depressed. A doublet-type antenna is used, in order to minimize the difficulty of obtaining a good ground in portable locations. For the low frequency (375 kc.) work, the antenna is operated as a Marconi antenna. Reliable communication on all three frequencies up to 150 miles is claimed.

The receiver covers the ranges from 200-400 kc., 1200 to 2900 kc., and 2900 to 6500 kc. covering all important communication channels as well as part of the broadcast band. A double reel for adjusting the lengths of the doublet sections of the antenna has also been developed.

Transmitter, receiver, power — all in one box.

THE AVIATION NEWS

REVIEW, COMMENT, FORECAST

OCTOBER 1938

DANIEL SAYRE

C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. P. Lockin, *New York*

Air Corps Wins Collier Trophy

(Story on page 66)

RETAILED: Ed Allen gets back to work at Seattle and gets the Boeing 314 into the air with a new double-surfaced directional tail group. When all the cards are down, the one vital factor in the trans-Atlantic transport picture is equipment. At least as far as America is concerned, the one vital factor in our equipment picture is this fleet of the Boeing clippers. Allen back in the air means America back in the ring. Story on page 52.

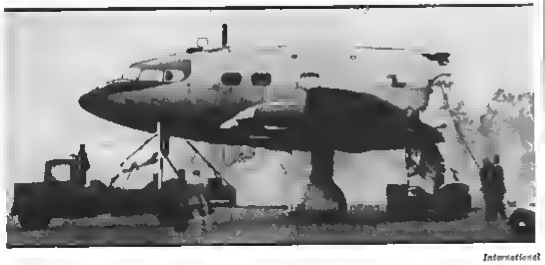
TUNNELLERS EXTRAORDINARY: Professors John R. Markham and Heinrich Peters of the Massachusetts Institute of Technology look pleased at the first test run of the new Wright Brothers Wind Tunnel at Cambridge. Peters was project engineer on the tunnel, Markham was project engineer on the wierdly automatic balances that show all data on the instrument panel, right. Story, drawing and description on page 60.

SPOT LANDINGS ON THE MONTH'S NEWS

Renewed Boeing tests put U. S. back in Atlantic picture

News of trans-Atlantic progress by the four "most interested nations" continues to be aviation's number one story. The Lieut. de Vaisseau Paris put France into the "flights-made" column for the first time when it landed at Port Washington, August 31st, after a 22-hour and 48-minute crossing, with a crew of eight. Three days later it headed homeward and cut its N. Y.-Azores time to 23 hours and 27 minutes. The Germans continued their weekly shuttle into Port Washington from Horta and gathered some nice extra publicity by sending the "Nordwind" out to the Cleveland races, where, of course, it based on nearby Lake Erie. On Sept. 12th it sent its "Nordstern," newest of its three seaplanes, into New York for the first time, and set a new record for the course of 13 hours and 13 minutes. That's an average of 176 m.p.h. of ground speed and is extremely creditable on any east-west crossing. Externally the "Nordstern" does not differ radically from the "Nordmeer" or "Nordwind", but its Juneau 205-C diesels give it considerably more cruising power. The British failed to score any more flights. In fact it lost one of its strongest entries in the trans-Atlantic derby when a de Havilland Albatross crashed during a test flight. The United States made no crossings either, but for the first time in months there was definite and constructive progress to report. Out in Seattle, Ed Allen got a new start on putting the big Boeing 314 through its test flights. Equipped with a new twin-ruddered tail, and with its hydrodynamic stabilizers moved through a few degrees of adjustment, the big super-Clipper is reported to be giving a beautiful performance, and is already well along on taxiing and flight tests with loads approaching its rated maximum. Added to that, the American Export Steamship Company's subsidiary, American Export Air Lines, announced the signing of a contract with Consolidated Aircraft for a commercial version of the PBY Patrol Bomber, to cost an approximate $200,000. The move gives substance to some three years of studies and investigations by that company. Survey flights are to start early next summer and will be aimed largely at a service into the Mediterranean.

The D. H. accident was probably one of the toughest breaks (no pun) on the modern records. The plane's gross loading is rated at an approximate 25,000 lb. To make sure the ship would be able to lift off sufficient fuel and a practical mail load for a trans-Atlantic crossing, factory officials had loaded it some 3,000 lb. beyond this figure. The ship was to make three landings so loaded. Young Geoffrey de Havilland, who serves his father's company as chief test pilot, landed the plane twice with no apparent trouble, save that eye witnesses report considerable deflection of the cabin could be spotted from the sidelines. After the third landing, the ship was taxiing to the side of the field and the pilot was about ready to cut the switches when a door in the side of the plywood fuselage burst open and the ship simply broke into two sections. None of the test men aboard was injured. Undaunted, the factory proceeded with production on some five additional models of the same ship. In a special cable to AVIATION, the elder Mr. de Havilland said: "The breakage of the fuselage was due to a definitely weak point allowing a tension failure to occur. The strengthening of this point was a simple matter and the other machines are now modified and flying. The failure was in no way associated with the type of construction of the fuselage, which is considered entirely satisfactory."



International

TOUGH BREAK: De Havilland Albatross cracks open after test flight.

International

OUR LOSS: Captain Frank Hawks.

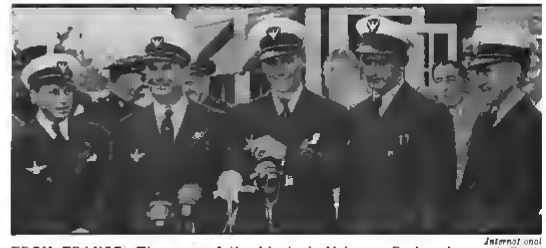
Aviation lost one of its brightest lights last month, with the death of Frank Hawks while demonstrating the Gwinn Aircar near East Aurora, New York. A careful reconstruction of the accident indicates that the little ship, after making a successful takeoff, ran full tilt into electric and telephone wires, rendered practically invisible by a background of trees.

Hawks' achievements in aviation were so numerous and well-known that they need but the briefest summary. An Early Bird, and a war-time instructor in the Army air service, Hawks took upon himself the demonstration of the speed possibilities of modern aircraft at a time when our air lines were still satisfied with speeds of little more than 100 m.p.h. Between 1929 and 1932 he set no less than 214 spectacular inter-city records, both in this country and abroad. In 1930 his transcontinental glider tow did much to encourage motorless flight. In this last year he turned from the spectacular to the promotion of "safety and comfort in private flying" and until the time of his death was devoting every particle of his almost limitless energy to the task of putting across the ingenious Gwinn plane.

We lost another friend in the death of Dr. Willis R. Gregg, chief of the Weather Bureau since 1934. One of the outstanding weather men of the country, Dr. Gregg had served with the Bureau since 1904, spending a large part of his career as head of the aerological division. His interest in aviation was unbounded, and his work in increasing the Bureau's activity in upper air soundings will form an everlasting monument. His death followed a heart attack which came as the doctor was taking an important part in the air lines' safety conference at Chicago.

Lighter-than-air is again active. On Sept. 14th, Dr. Hugo Eckner christened the LZ-130 "Graf Zeppelin" by smashing a bottle of liquid air over its cowl. Then the huge ship, inflated with hydrogen for testing purposes, was towed from its hanger at Friederichshafen and put through a maiden voyage with a crew of 29 and 45 officials of the company and Air Ministry. In America, the Navy's project to build a medium sized training ship ran up against delay in a decision between a project of the orthodox type and one of all-metal construction. The Navy is reported to be favoring the former, but passed the decision up to the President himself.

Business as usual during the China-Japan war turned out to be a bad policy for both C.N.A.C. and Eurasia. After the shooting down of a C.N.A.C. ship, the wise boys figured the Japs were too fond of Germany to molest Eurasia, but two of theirs were knocked off shortly afterward. When the lines protested they were told that permission might be granted for flights if application was made several weeks in advance for each flight, complete with passenger lists and reasons why they wanted to go there anyway. That makes it hard to run an airline, and C.N.A.C. and Eurasia have both discontinued their lines within Japanese reach. Foreign lines running to Hongkong have been safe so far, but there are a lot of crossed fingers hoping a nearsighted or overambitious Jap doesn't bag a Clipper [illegible]. The blow sent the international air law experts into a flat, flat spin. When they came out of it they announced that it didn't make much difference what anyone said. A transport ship was mighty hard to tell from a bomber to start with, and even if it did look like a transport it might be loaded with bombs, so anything that flew would probably be fair game in a war [illegible]. Another skirmish on the air law front followed Britain's warning to civil planes to stay out of a big area over the North Sea during her air maneuvers—a patch that went clear up to the Dutch coast. K.L.M. kept right on running to London in spite of it, which was fine according to the law boys. If K.L.M. had stopped, they claim a bad precedent would have been set, as nobody before had ever tried to bust up the accepted idea that the air over the oceans belongs to everyone.



International

FROM FRANCE: The crew of the Lieut. de Vaisseau Paris relaxes at Port Washington after France's first trans-Atlantic survey crossing. Left to right—Georges Bouchard, radio; Henri LeClaire, 2nd pilot; Henri Guillaumet, first pilot and chief officer; Paul Comet, navigator, Jacques Neri, radio.

International

IN FRANCE: Potez tries out a six engined flying model of the Potez-161, projected trans-Atlantic giant. The model was built to one third scale.

International

NAZI CLIMBER: Emil Kropf demonstrates the amazing Fiesler Storch.

The National Air Races are dealt with on other pages. One part of the program, however, was sufficiently unique to rate separate mention. It was the demonstration of the astounding Argus-powered Fiesler-Storch safety plane recently developed in Germany. Emil Kropf, German stunt flyer, put the ship through an astounding range of stunts between a speed range of 20 and 120 m.p.h. Outhovering a gire, unbanked turns, short run takeoffs, dizzy climbs. This triumph of the slot-and-flap art should prove of infinite value in such work as Polar exploration and geological survey. Average comment among American designers: Boy, wouldn't it be swell to have the money to build something like that.—D.S.

DAY BY DAY WITH THE C.A.A.

AS YOU WILL REMEMBER, the Administrator of the Authority, the Chairman and Members took the oath of office on Aug. 6, two full weeks before the new law was to go into effect. Soon after that, it appointed Paul J. Frizzell as Secretary and Charles S. Guthrie as its General Counsel. Then as the various members found quarters in the collossal-but-crowded Commerce Building and began scurrying around for air conditioning units, real work commenced. Go on from there—

AUG. 18 (In General Orders 403-1 and 412-1) all scheduled air carriers were given until October 3 to file complete data on fares, rates, pooling agreements and other matters needed by the Authority in its rate-fixing and practice-ruling duties. Non-scheduled commercial operators were given until Dec. 20 to file such information.

AUG. 20 (In General Order 401-B-1) specifications were issued for the exact form in which carriers must make application for certificates of public convenience and necessity. Special date for lines applying under the Acts "grandfather" clause were also listed.

AUG. 20 (In General Order 601-A-1) the entire Civil Air Regulations (May 31, 1938 version), in the judgment of the Authority "the result of much study, research and analysis," were taken over lock-stock and barrel by the Authority save for some minor changes—largely of language to make "Bureau of Air Commerce" read "Civil Aeronautics Authority," etc.

AUG. 20 (In General Order 610-A-1) action on certification of many classes of airmen, brought under regulation for the first time by the new Act, was postponed to Dec. 20. These classes include those in charge of inspection, maintenance, overhaul and repair of accessories, instruments, and parachutes.

AUG. 22 as the Act Creating a Civil Aeronautics Authority became law in effect, the approximate 2,900 employees of the Bureau of Air Commerce became once (and practically for all) employees of the C.A.A. One notable exception was the genial Denis Mulligan head of the B.A.C. since last Spring, whose resignation was accepted "with the greatest reluctance." The C.A.A. also absorbed the hundred-odd employees of the Air Mail Division of the I.C.C. One notable inclusion was Norman Haley, director of that I.C.C. division. His long I.C.C. experience should prove a priceless asset to the new bureau. Also on Aug. 22, Col. Sumpter Smith and Thomas O. Hardin were sworn in as members of the Safety Board.

AUG. 23 (In Special Orders 401-A-L, 401-A-2 and 401-A-3) Pennsylvania-Central was given permission to continue operating an extension between Detroit and Sault Sainte Marie for 60 days pending action on its application for a route certificate. United was given similar leeway on its service into Monterey, Calif. Western Air Express was allowed to continue its seasonal service to Glacier Nat'l Park until Sept. 30.

AUG. 23 (In General Order 1107-K-1) the Authority put off until Nov. 20 the change from Post Office air mail payments on the basis of the old contracts to the basis of new mail rates to be set by the Authority. The Post Office let it be known it might even then request a further extension of time.

AUG. 25 Chairman Noble announced the appointment of Carl B. Allen as consultant to the Authority, presumably on its public relations problems. An old time flyer and veteran aviation editor for New York newspapers, Allen was given a three months leave of absence by the N.Y. Herald Tribune to take the position. Soon after this announcement the Authority hired John Stewart, also from New York as permanent press relations man and installed Patricia O'Malley as first assistant in that department.

AUG. 25 the Authority, pending the outcome of a complete investigation into the problem of a uniform accounting system, decreed that the air lines should submit data as to their financial conditions in the form prescribed by the Post Office under the Air Mail Act of 1934. This submission of data was to be regarded as the opening gun in the Authorities' announced "first task"—the determination of "fair" rates for mail carriers.

AUG. 29 (In Special Order 401-A-4) Pan American Airways was authorized to continue survey flights between Seattle and Juneau, Alaska. It might carry mail or express but not passengers during the period before final route certification.

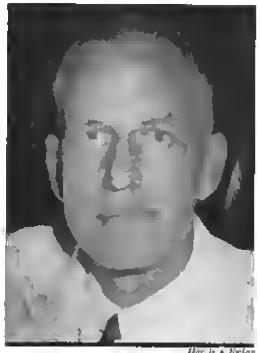
AUG. 31 the C.A.A. announced the creation of a new Private Flying Section and the appointment of Grove Webster of Hackensack, N. J., to head it. (See story on page 58.)

SEPT. 3-5 the Authority went to the Air Races at Cleveland—but not just for the pleasure involved. At a banquet tendered Sunday night by the N.A.A., the members were "introduced" individually and collectively to more than fifty officials of the country's air transport officials.

SEPT. 6-7 the Authority sat down in Chicago with many of the same officials they had dined with in Cleveland and gave their weight to the shaping up of a safety program for the coming Winter. (See story on page 54.)

SEPT. 12 the C.A.A. went on record endorsing National Air Travel Week. "Be it Resolved, that the Civil Aeronautics Authority officially commends the spirit and purposes of this celebration and extends its best wishes to the groups sponsoring it."

SEPT. 16 the Authority announced that G. Grant Mason, gone to Europe to head the American delegation to the Fourth International Conference on Private Air Law, would remain abroad for some time making a survey of civil aeronautics — airlines, private flying, airports, etc. Denis Mulligan, former, B.A.C. head, is another member of our delegation.



Here is a living

SECRETARY: Paul J. Frizzell

Here is a living

GENERAL COUNSEL: C. S. Guthrie

ADVISOR: Carl B. Allen

PRESS RELATIONS: John Stewart

AVIATION IN WASHINGTON

by BLAINE STUBBLEFIELD

Sideline Experting as the C.A.A. gets its coat off

CAA program in a paragraph—(1) Study financial status of domestic airlines and bases of compensation preparatory to fixing air mail rates. (2) Study accounting and reporting system preparatory to establishment of permanent, simplified, uniform procedure. (3) Try again to get private flying off the ground. (4) Consider airlines' desire for simplification of regulations. (5) Survey the airport system and report to Congress. (6) But not least, consider the airlines' request that money be asked for to close all gaps in the aids system.

And the unwritten program is headed by a devout wish of the Authority and all concerned that "winter and rough weather" will not bring accidents to mar CAA's prestige. Fact that CAA would be practically blameless, probably could do nothing on such short notice, would not soften the blow. CAA can hope that the good effect of its mere existence will help to accomplish the immediate results desired: (1) the prospect of better mail compensation will induce operators to discount their futures for those expensive details of equipment service, and deliberation that make for safety; (2) a let up on herdriding of schedules to complete mail trips for income—if such practice exists; (3) relaxation of the speed race which grew out of inter-line competition and not out of public demand. Operators and CAA understand without words, that whatever can be done for safety will be done.

The industry wants merely, all gaps closed in the airway aids system and urges CAA to ask Congress for nearly $18,000,000 to do the job in the U. S. and Territories. Obsolete aids, or none, make the cost of carrying the mail higher than necessary; increase the risk of accident, and loss of life and property per accident increases as ships get bigger. Operators feel they must stop accidents before air travel can be sold on a big-league scale. That word "territories" means Alaska, a spot to watch for important doings in aviation. The other main hope of air transport is more mail revenue.

Nobody was killed in the rush for new-route certificates. Some had expected a run on the certificate window, even suggesting an armistice for a few months. It now seems plain, they say, that the lines, already in red, don't want sparse-picking routes to lose more money. But that doesn't close the feeder line issue by a jug-full. California's San Joaquin and Sacramento valleys have tackled United Airlines for a feeder system. Probably it wouldn't pay. But the native sons, undismayed, may ask Congress for pump priming to subsidize it. While Uncle is priming things, why not aviation? they reason. CAA definitely declines to play Santa Claus. The country's big towns will be in Washington objecting to the airline go-by; you can depend on it.

CAA takes off on airports and this is the abc of it. The law orders the Authority to make a study of existing system of ports and report to Congress not later than Feb. 1, 1939. That report shall recommend (1) whether or not the Government should participate in construction, improvement, and operation; and (2) if participation recommended, to what extent—meaning how much money. So CAA has a staff in the field under Major McMullen getting data, and one at home (in a vacant store building) headed by Douglas L. Cullison, putting the statistics together. Nobody seems to be against the Government's paying for the airports, except a few taxpayers, and you can make your own prediction.

How to get private flying off the ground, where it has lain air-sick for several years, is the subject of another CAA study. The new Private Flying Unit, headed by Grover Webster, is doing the job. The industry and private flyers will be asked again what they think is wrong and what to do about it. Officials anticipate several possible remedies. Let down a bit on physical requirements, some of which seem unnecessary. Simplify the regulations. Encourage building more horse-pasture airports (the airport investigators have this in mind). Find some way of making airplanes cheaper. None of those is new. But a hint that the government might be asked to help, as Russia, England, and Germany do, would be news if it happened.

With what kind of airplane? Even before the private flying unit starts its search for ideas, design authorities in other branches of government say it's not even warm. They say that coaxing on average person into a conventional airplane is like inviting him to go tiger hunting. The first automobiles were

ASSISTANT PRESS RELATIONS: Patricia O'Malley

sold, say they, to people who drove them for fun The airplane to start an industry should be slow, safe, good only to go up for pleasure Present airplanes are built on pilots' conceptions, in their opinion, and are not suitable But the other school answers people won't buy planes that can't go against a spring zephyr and get some where

NACA Is happy, having escaped the mild threat of being bottled in some other government agency It's pleased too that the new law empowers the President to specify tenures in office of appointees, so that new brains come in, contributes their stuff, or move on and make way for others who can Four old members Ames, Wright, Warner, Lindbergh were re appointed for five, five, three, and one years Four new members were named Mr. Noble and Mr Hester to sit during their tenure with CAA; Dr Vannevar Bush and Dr Jerome Hunsaker for three and one years Effective August 23, 1938, Navy has two members, Army two, CAA two, Weather Bureau one, Bureau of Standards one, Smithsonian Institute one, making nine, plus six in private life total 15—all serving without pay. (Might be interesting if NACA got a crack at the private flying problem some day.)

Dennis Mulligan's brief directorship of the late Bureau of Air Commerce set him up in Washington as an effective executive, good diplomat, and a dispenser of good cheer which is far too scarce in the world He's representing CAA at Brussels Private Air Law conference. Watch for him to turn up in important spots

Wide World

ONE ARM FULL: Tony LaVier hangs on to the Greve Trophy after a gruelling ding-dong with Art Chester.

Wide World

TWO ARMS FULL: Roscoe Turner gives the old victory hug to Jacqueline Cochran, Bendix winner and Fred C. Crawford, donor of the Thompson Trophy. Turner's win broke the Thompson record, set a new American closed-course record and made him the first pilot ever to win the Thompson Trophy twice

Cochran, Turner, LeVier Sweep Races; Industry Applauds Three Day Meet

THERE will always be, we suppose, two distinct classes of people who turn out each year for Cliff Henderson's National Air races The first consists of those confirmed turnstile spinners, the average public—housewives, business men, clerks, factory workers, farmers, what have you. To judge simply by their numbers they certainly liked the 1938 races. They flocked on Saturday, swarmed on Sunday, tidal-waved on Labor Day until the dust and sweat lay inches deep on the hard-working National Guardsmen in charge of the colossal parking lots.

The other class, the Industry, turns up by scores and hundreds not thousands. But it takes it upon itself not only to judge the spectacle from its own sophisticated viewpoint It worries and worries about what the spectacle is doing to the air-mindedness of the other 79,000 cramming the rest of the grandstands. Well, even these Air Race Observers of the Second Class came away endorsing the 1938 Races

One. The Gods had smiled on the Week-Before activities that so often in past years have given the Races a blood-and-thunder send off Major doSeversky piled 500 gallons of gasoline into Jacqueline Cochran's Seversky, roared down the runway at Floyd Bennett Field at 7:37 A M, Aug 29 At Kansas City he paused briefly to pour in another 350 gals. Ten hours and three minutes after take-off he had landed at his Glendale goal. That set a new East West record and the keynote for meeting

Two. The Bendix made less "trouble" headlines than in any previous year we can remember. Two days before the race gallant 72-year-old Bernarr Macfadden cracked up his entry while practicing landings But between midnight and breakfast on Sept. 3 all ten remaining contestants got away to clean starts from Burbank's Union Air Terminal. The weather was definitely lousy J Cochran, winner, reported crashing non-stop at 16,000 to 22,000 feet, "smoking" an oxygen tube all the way, seeing the ground for scarcely half an hour all the way across. Others confirmed her reports But her time (though not a new record for the Bendix) was excellent. Refuelling at Cleveland she pushed on to Bendix, N. J., then swung in for a landing at Floyd Bennett in a total elapsed of 10 hours 12 minutes and 55 seconds That missed Fuller's 1937 record of 9 hours and 35 minutes but set a new woman's transcontinental mark. Fuller also made an excellent showing in second place He had had to stop for fuel at Wichita During the take-off at Cleveland his engine cowl cracked Even so his total time into Bendix was only 10 hours and 21 minutes.

Three The Greve race was a dark Tony LeVier and Art Chester flew a first place formation through the whole race, first one then the other would slide forward into the lead Ten times in twenty laps the lead changed. Finally Chester chipped a pylon, flashed back, then began a fast stern chase At the finish his average speed was only 0.45 m p h slower than LeVier's. Both broke the record.

Four. The Thompson could not have turned out more popularly if it had been rigged Turner slipped into first in the early laps and was never headed. He had no engine trouble, He skipped no pylons Earl Ortman hung on but could never challenge. Oshkosh Wittman, in his astounding home-made "special," flew a beeda-up, conservative race in third. Somehow the crowd, at least the industry part of it, was all behind Roscoe

Five. Lengthening the Greve to 200 miles and the Thompson to 300 really put those racers to the test. Engines particularly just had to be good to take such bastings That Manascos swept the Greve and Pratt and Whitney's made off with the Bendix and Thompson really meant something this year and took on the stature of real sales assets.

Six. Oh yes, the spectacle-events were all right too. The Air Corps and Marines gave their usual top flight performances of squadron maneuvers Hegenburg, Pepana, Johnson, Graners, Benkin and Company gave high grade stunting shows Mike Murphy, Kokomo flying instructor astounded Earl (Edo) Osborn by landing on and taking off the grass in an (Edo) float-equipped light plane Hans Reitsch did a daily stint of stunting in a soaring plane The D L H sent their trans-Atlantic seaplane Nordwind out to salute the grandstand crowds Emil Kropf demonstrated the amazing "Storch". Possibly it was the wind, possibly it was the presence of the C A A. in the grandstand, or possibly it was just plain good management but it seemed to us no one took any damfool chances.

See you at next year's Races

LET'S TALK BUSINESS

Glenn L. Martin Company announces that total sales for the half year amount to $7,241,325 Company's books show a backlog of unfilled orders at the close of the second quarter of $16,175,908, compared with $17,624,575 Dec 31, 1937

Donald W. Douglas announces that Major Carl Cover, Director of Sales and Chief Pilot of the Douglas Company, has been made Senior Vice President, succeeding the late Harry H. Wetzel Despite the Company's current backlog of $25,545,642 of unfilled orders, production during the latter half of its fiscal year, ending Nov 30, 1938, will doubtless drop behind that of the first six months, due to the delay in getting into production on the B-18 A bombers because of changes specified by the Army. Delivery of 133 B-18 bombers has been completed, and 255 of the B-18-A type, of the same basic design, have been contracted for No orders are on hand from domestic airlines, and there is a possibility that the Company will develop the present DC-3 with engines of greater horsepower Action on the declaration of a dividend for the current fiscal year is expected to be taken at the regular directors' meeting on Nov 15th

Stinson Aircraft Corporation's property and personnel has now been completely reorganized as the "Stinson Aircraft Division of Aviation Manufacturing Corporation". This change is primarily for corporate purposes; the Aviation Manufacturing Corp having owned over 93 per cent of the Stinson stock Other divisions of Aviation Manufacturing Corp are Vultee Aircraft Division at Downey, Calif, and Lycoming Division, at Williamsport, Penna. W. A Mara and O R Stacks, both long associated with the Stinson Corp, have been elected vice-presidents of Aviation Manufacturing Corp, in charge of sales and manufacturing respectively

Ryan Aeronautical Company has flown a Ryan S-T-A Special from San Diego to Langley Field, Va, for delivery to the National Advisory Committee for Aeronautics. The low-wing, metal-fuselaged monoplane will be used for flight research Although this model is

Who Won What at The 1938 National Air Races

BENDIX TRANSCONTINENTAL SPEED DASH — SATURDAY, SEPTEMBER 3, 1938. (Burbank, Calif.-Cleveland, O.)

Place	Pilot	Plane	Motor	Cu. In. Displ.	Elapsed Time	Speed	Money
1	J. Cochran	Seversky	P & W Tw Wasp	1830	8-10.31 4	249 774	$14,500 00
2	F Fuller, Jr	Seversky	P & W Tw Row	1830	8-33-29 2	238 604	5,800 00
3	F. Mantz	Lockheed Orion	Wright Cyclone	1823	9-36.25 4	206 579	3,000 00
4	M Constant	Beechcraft	P & W Wasp Jr	985	10 14.39 6	199 330	2 000 00
5	Ross Hadley	Beechcraft	P & W Wasp Jr	985	11 13 46 4	181 842	1 000 00
6	Chas LaJatte	Spartan	P & W Wasp Jr	985	11-30 27 2	177 449	
	Geo Armistead	Gee Bee	P & W Hornet	1690	Dropped out of race		
	Bob Perlick	Beechcraft	Wright Cyclone	1823	Dropped out of race.		
	F. Cordova	Bellanca	Ranger 2 Menasco	1860	Dropped out of race.		
	Lee Gehlbach	Weddell-Williams	P & W Wasp Jr	985	Dropped out of race		

LOUIS W. GREVE TROPHY RACE — SUNDAY, SEPTEMBER 4. (20 laps on a ten-mile course)

Place	Pilot	Plane	Motor	Cu. In. Displ.	Elapsed Time	Speed	Money
1	Tony LeVier	Schoenfeldt Spec	Menasco C6S4	544	47:49 89	250 88	$12,000 00
2	A Chester	Chester Special	Menasco C6S4	544	47 55.22	250.416	5,000 00
3	J. Jacobson	Keith Rider	Menasco C6S4	544	54.57 03	218 278	2,000 00
4	E Ortman	Marcoux-Bromberg (Jack Rabbit)	Menasco B6S	544	56.06 18	192 503	1,000 00
	H. Crosby	Crosby CR4	Menasco C6S4	544	Dropped out end of 14th lap		549 23
	G. Dory	Bushey-McGrew Spec	Menasco C4S	363	Dropped out after 12th lap		470 77

THOMPSON TROPHY RACE — MONDAY, SEPTEMBER 5. (30 laps on a ten-mile course)

Place	Pilot	Plane	Motor	Cu. In. Displ.	Elapsed Time	Speed	Money
1	R. Turner	Turner Laird (PESCO)	P & W Tw Wasp Sr	1830	63.30 61	283 419	$22,000 00
2	E Ortman	Marcoux Bromberg	P & W Tw Wasp Jr	1535	66-44 18	269 718	9,000 00
3	S. J. Wittman	Wittman Racer	Curtiss D-12	1145	69 26 87	259 187	4,500 00
4	Leigh Wade	Military Aircraft	P & W Wasp Sr	1830	72-02 74	249 342	2,500 00
5	Joe Meckey	Weddell-Williams	P & W Hornet	1690	72-06 44	249 628	1,800 00
6	J. Jacobson	Keith Rider	Menasco	544	27 laps	214 570	1,400 00
	A Chester	Chester Special	Menasco	544	Completed 20 laps		600 00
	H. Crosby	Crosby CR 4	Menasco	544	Completed 10 laps — disqualified		

not used for military service in this country, military versions (Ryan S-T-M) have been exported to the air forces of Mexico, Guatemala, Honduras and Nicaragua.

A. S. Menasco has resigned as Vice President and Director of Menasco Manufacturing Company and will take a six months' vacation and rest. Gardner W. Carr, president of Menasco, will take over the sales and production duties formerly handled by Menasco.

AC Spark Plug division of General Motors has as new general manager L. Clifford Goad, succeeding Fred S. Kimmerling who has been on leave of absence because of ill health since September 1937. Goad came with AC in 1933, has been general manufacturing manager since 1934.

The Austin Company plans to establish its own construction organization in England, under the managing directorship of Allan S. Austin, to be known as Austin Engineers Builders, Ltd. Decision followed an extensive survey by Albert S. Low, vice-president of the company, who has been abroad since May and who is organizing the engineering staff. Clayton L. Foster will head the architectural division.

Gearwie Airplanes announces export of four 90 hp. Sportsters to New Zealand, Tasmania, and Brazil, and a 125 hp. Speedster to Costa Rica. Two more Sportsters are seen to be delivered to Bangkok for use by the Royal Siamese Air Force as trainers, another will go to New Zealand.

CLEVELANDER: Glenn L. Martin dipped back into the days when his bustling factory was located in Ohio's northern metropolis when he was recently in need of a new executive. As a consequence Marsh K. Powers, former president of his own advertising agency, has become assistant to the president in charge of advertising and public relations for the Glenn L. Martin Company.

VULTEE JOINERS: The Vultee Aircraft Division of Aviation Manufacturing Corporation made V. Charles Scherlemmer (left) its new comptroller last month and put William C. Rockefeller (right) in charge of aerodynamics. Scherlemmer has been assistant treasurer and treasurer for Aviation Manufacturing since 1934. Rockefeller was technical advisor to Howard Hughes at the time of his appointment. Vultee Division has also made G. T. Bovee its chief auditor and put P. A. Hewlett in charge of its New York Office.

Lockheed Aircraft Corporation's sales for the six months ending June 30th reached a new high of $5,111,639, an increase of 92 per cent over the same period in 1937. Deliveries included 47 Lockheed-14's, 9 Electras, 4 Lockheed-12's. Backlog of unfilled orders at June 30th was $23,522,930, compared with $3,137,374 at the same data last year. Late in August the company commenced delivery of its 13-plane order to the U. S. Army Air Corps for planes of the high speed personnel-transport type, similar to Model 12, and on four of its Model-14 type for the British Airways' service to British West Africa. Some slackening of production is anticipated in the final quarter of the year while preparations are completed for large scale production of the 200 modified Model-14 type bombing planes for England, but it is believed that production will hit a new high early in 1939. It is rumored that flight tests of the super speed twin-engine pursuit type, purportedly being built for the U. S. Army, are not far in the future. The company's personnel totals 2,963.

Brewster Aeronautical Company has purchased the former Pierce-Arrow property in Long Island City, N. Y. The property occupies a square block with a land area of about 91,000 sq. ft., and consists of a four story building, a one story extension, a one-story garage, and a vacant triangular plot. The buildings have a floor area of 170,000 sq. ft. The Brewster Company is busy with production of a large contract for scout bombers for the Navy.

North American Aviation, Inc., has sold Canadian manufacturing and sales rights to its advanced combat-trainer to Noorduyn Aviation, Ltd., of Montreal. It was intimated that 1,000 of the speedy military craft may be built by the Canadian company to bolster Great Britain's air force. The planes to be built in Montreal are similar to those specified in the 200-plane, $8,000,000 order recently placed with North American by the British government.

Aeromarine Instrument Company, Adolf Urfer, president, formerly located in New York City, has moved to new and larger quarters at 432 Fairfield Avenue, Stamford, Conn. The move was required by recent rapid expansion of the company's business.

Aircraft Accessories Corporation of Glendale, Calif., celebrated their first anniversary by expanding their activities on a nation-wide scale. Ed Burke, sales manager, has just concluded a tour of the United States in the interest of the hydraulic actuating systems manufactured by the firm. Henry Reisner, formerly of Fairchild Aircraft Corporation, has signed up to handle eastern sales. Other company officers are Ted Lynn, President; W. J. Hosmer, Vice President; and Rodney B. Campbell, Chief Engineer.

Phillips Aviation Co. has acquired substantially all of the physical assets, though not the business, of Western Airmotive Corporation of Van Nuys, Calif. Construction of the "Western Pirate" has been completed by the Phillips people, and with the new designation of "Phillips CT-1" is now undergoing flight tests under the supervision of George Byars, company test pilot. Kent Hamilton, formerly with Boeing, is in charge of engineering on the CT-1. Roland Pierson, until recently president of the Skylark Co., John Shensby, and Harry L. Gibson have joined the Phillips staff. Flight testing of the new all-metal Phillips XPT is scheduled for September.

PROFITS AND LOSSES

» AIR ASSOCIATES, INC has declared the regular September quarterly dividend of 12½ cents per share on common stock payable on September 28, 1938 to stockholders of record September 16, 1938 The quarterly dividend of 12½ cents per share normally payable in December, 1938, will be paid at the same time as the September dividend This action was taken in order to include this distribution in the fiscal year of the corporation, ending September 30, 1938. The regular quarterly dividend of $1 75 per share was declared on the $7 cumulative preferred stock, payable September 26, 1938 to stockholders of record September 19, 1938

» BENDIX AVIATION CORP and Subsidiaries, for quarter ending June 30, 1938, net profit of $55,606, equal to 3 cents on 2,097,883 capital shares Compares with net profit of $825,453 or 39 cents for same period last year; and with net loss of $561,605 for March quarter, this year For six months ending June 30, 1938, net loss of $495,999 compares with net profit of $1,831,861 for the first six months in 1937.

» BOEING AIRPLANE COMPANY and Subsidiaries, for 12 months ending June 30, 1938, net loss of $35,975 after depreciation, interest, taxes and other charges Indicated net loss for first six months of 1938 was $93,751, compared with net profit of $253,897 for same period in 1937

» CENTRAL AIRPORT, INC., for year ending April 30, 1938, net loss of $15,395, against net loss of $15,605 for preceding fiscal year

» FAIRCHILD AVIATION CORPORATION declared an initial dividend of 15 cents a share. Earnings for the first half of this year are estimated at about 45 cents a share

» GRUMMAN AIRCRAFT ENGINEERING CORP declared a dividend of 25 cents a share on common stock, payable June 27 to stockholders of record June 21

» HANDLEY PAGE, LTD, for 1937 net income of £210,128, compared with net income of £100,181 for 1936

» LOCKHEED AIRCRAFT CORPORATION for six months ending June 30, 1938, net profit, after deductions, of $151,075, equalling 22 cents on 660,876 common shares. Compares with earnings of $281,563 or 43 cents on $659,213 common shares for 1937.

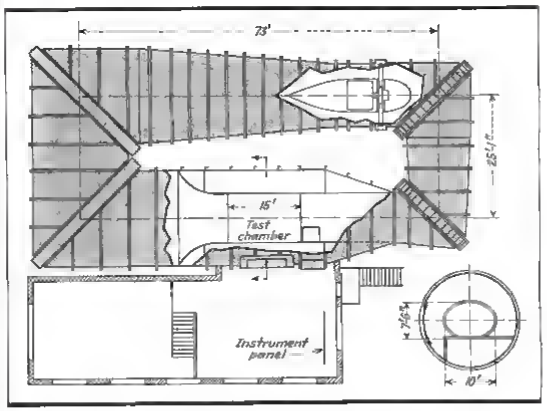
» GLENN L MARTIN COMPANY, for six months ending June 30, 1938, net profit of $1,372,000, or $1 46 on 936,583 shares. Same period last year, net profit of $526,307 or 81 cents per share. For quarter ending June 30, 1938, net profit of $744,037 or 79 cents a share, compared with $826,583 or 72 cents a share for quarter ending March, 1938

» NATIONAL AVIATION CORP, liquidating value at June 30, 1938, $12 97 per share; compared with $12 70 on December 31, 1937, and $15 95 on June 30, 1937.

» SPERRY CORP for six months ending June 30, 1938, net profit of $2,107,780, or $1 05 a share, compared with $1,340,497 or 88 cents a share for same period in 1937 Latter figure included $183,795 profit from sale of securities.

» TRANSCONTINENTAL & WESTERN AIR, INC, for six months ending June 30, 1938, net loss of $933,168, compared with net loss of $487,141 for same period in 1937 Total operating revenues for first half of 1938 amounted to $2,656,022, an increase of $245,766 over first half of 1937, but increased operating expenses for 1938, $3,516,358, against $2,943,057 for 1937, were responsible for the increased loss.

» UNITED AIR LINES TRANSPORT CORP, for quarter ending June 30, 1938, net loss of $243,031, compared with net loss of $59,850 for quarter ending June 30, 1937, and net loss of $667,670 for quarter ending March 31, 1938 Net loss for 12 months ending June 30, 1938, $1,202,603, against net loss of $68,532 for 12 months ending June 30, 1937. During quarter ending June 30, 1938, total operations were 43 per cent greater than like period in 1937, but operating expenses and taxes increased 137 per cent



M.I.T. Dedicates New Wind Tunnel; Reaches 400 m.p.h. at ¼ Atmosphere

EARLY IN 1902 the Wright Brothers were up against a tough one. Somehow all the aerodynamic data they had gathered from Lilienthal, Langley, and other pioneers didn't seem to pan out Gliders they had built using such figures had flown all right as kites and convinced them of the value of wing warping, but, although designed for it, they had not been able to carry the weight of a person. Reluctantly the Wrights settled down to a serious study of an art they had taken up as a hobby In the back room of their Dayton, Ohio, bicycle shop they knocked together a "wind tunnel", an open-ended box 5 ft. long, 18 in on the side. At one end they set up a small variable speed fan and proceeded to test some fifty models

It was this technical patience and insight to which the Massachusetts Institute of Technology drew attention last week as it dedicated its huge, new Wright Brothers Wind Tunnel. Built up out of welded steel, M I T 's new aero-dynamic tool is based on the original Prandtl return flow design, but has built into it more versatility than possibly any other tunnel in existence It can be put under a pressure as large as four atmospheres, thus attaining a Reynolds number of 6,500,000 or it can be evacuated down to a quarter atmosphere corresponding to atmospheric pressure of about 35,000 feet. At this later pressure the big adjustable bladed fan, driven by a 2,000 hp. motor, can set up a wind speed of 400 m p h.

AS OTHERS FLY IT

A Birdseye-View of Aviation Abroad

German lines get top-flight equipment

Behind the window dressing of Atlantic flights the Germans have stepped out in an equipment program that will put Lufthansa right up in front before long. For the last few years it's had a marvelous combination of winged boxcars that kept plugging along day after day without breaking any speed records and a lot of small hot types in which the passengers were whizzed around Europe without being able to raise their heads above their knees. Now while the U. S. experts are still arguing about how big an airplane should be, the Germans are sticking out their chins and putting 4-engined Junkers Ju 90s (40 passengers) and Focke-Wulf Condors (26 passengers) on their mainlines. They're nice airplanes, too—roomy and comfortable but as fast as anything on the market. . . . before long they'll have two new long-range ships for ocean work. The Dornier 26 boat has just been unveiled. It has a hull like a bigger and cleaner Do. 16, gull wings, 4 Junkers Diesels (2 in tandem on each side) and retractable wing floats instead of the old Dornier custom of stub wings. It should be able to make the North Atlantic run with a few passengers and a good mail load. No dope has been released on any super-big Atlantic boats to haul real tonnage, but it's certain that they're on paper and something may be in the shop . . . The other longwinded ship is the Blohm and Voss Ha 142, which is pretty much a North Atlantic Ha 139 with a retractable landing gear in place of floats and B.M.W. radials instead of Junkers Diesels. Its job will be ocean mail-only runs.

The lowdown on diesels. now that Lufthansa has piled up a lot of hours on them, (over 16,000 in 1937 alone) seems to be that the bugs aren't out enough yet to make them a paying proposition over gasoline engines on ordinary routes. Increased maintenance costs have more than soaked up the saving on fuel bills. The Junkers engines have a tough spot in the piston that closes the exhaust ports, and while this is being licked little by little, the engines as they now stand have to be overhauled several times as often as gasoline engines. . . . B.M.W. is testing a radial diesel that uses a lot of parts from the Hornets they build under license. It's 4-stroke, using the same induction system less carburetor and the same valve action. A fuel pump is stuck back on the accessory section and nozzles put in the cylinder heads. A big advantage is that it's interchangeable with the gasoline engine as far as installation goes. They've also made a prestone-cooled model that interchanges too—the cylinders are jacketed and six small radiators are placed around between them. At present they're getting about 650 hp takeoff and 500 hp continuous, with around 1.65 lbs. per takeoff hp. Fuel consumption runs around .37 lbs. per hp. hour, which isn't down to the Junkers. The next step will be into two-row engines, where they hope to get around 1000 hp.

Piggyback plans have been changed every week or so in England. The announced schedule called for a bunch of Atlantic trips by the Mercury this summer, but after the first one the story was given out that the next move would be a crack at the distance record. They've been trying takeoffs with higher loads, and have it doped out that if they can get the gross weight from 10 up to around 14 tons the Mercury should be able to stretch 7,000 miles.

Meanwhile Major Mayo has gone on to bigger and better ideas. He figures the Mercury is too lightly loaded and wastes too much power lugging floats around—what he wants to see is a landplane with retractable wheels and a wing loading up around 45 lbs. sent off on top of another landplane. With this setup he hopes to cruise around 270 mph and really get somewhere with something. At the same time the military possibilities are being tooted more and more to persuade the Air Ministry to keep on angling.

These British orders in Canada have come close enough for the big Canadian manufacturers to gang up in a joint company to operate bomber assembly plants planned for Montreal and Toronto. Orders for parts and complete ships are expected to shower down any day now, and the boys are all talking in terms of millions. At present it looks as if the money for expansion of the industry is to be raised in Canada and not handed out from England under a shadow scheme. . . . A group of English manufacturers is dickering with the Australian gov't to set up a plant—they're worried over U. S. getting most of the business down there.

A Big Moment for British aviation came when the first 40-passenger Ensign went into service for Imperial. It was overdue enough to measure in years, having been held up by everything from the rearmament crisis to just plain bugs. When it was designed its cruising speed of 170 mph. and its size had the British all excited over how far ahead of the times they were, but now it's just another big slow airplane in the best tradition . . . To keep from being left behind again the Air Ministry is pushing plans for some new commercial ships. A 4-engined 16-passenger job cruising around 200 is supposed to be out next year, while still on paper are a fast big ship and one with a supercharged cabin to cruise at 270 mph at 25,000 feet . . . British exports for the first six months of 1938 were £2,865,000—just about twice last year's figure.

Some missing links in the world transport map have been filled in. Air France extended its Marseilles-Hanoi line through to Hongkong, connecting up with Pan American and Chinese lines. . . . K.N.I.L.M. has sent a line up from Singapore to Saigon, giving a direct Australia-Indochina service. Another projected connection—to join Pan American in Manila—was knocked out when the U. S. refused permission for military reasons. . . . Lufthansa has opened passenger service on its Far East line as far as Damascus. . . . British Airways hopes to get its South American service down the African coast as far as Bathurst this year. . . . K.L.M., which has just announced it won't get into the North Atlantic scramble, for the time being anyway, is lining up a South Atlantic route to connect with its lines in South America.

Bruguière

DORNIER'S LATEST: The Do.26 mailboat has four Diesels, no sponsons.

LOGGING THE LINES

Air Transport Drift Sights

— by DAN SAYRE —

Give the C.A.A. a hand on those safety rules

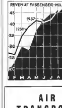
What a lot of sense came out of the meeting early last month in Chicago between the C A A and the massed executives of the air lines. Ralph Damon of American Airlines, acting as chairman, reported that the lines would submit for C A A approval a winter program covering the following points: (1) an agreement to relax schedules to permit cruising at only 50 per cent of maximum hp ; (2) the formulation of field rules on weather and dispatching so that one competing air line will not take off in weather deemed unflyable by others; (3) a widespread increase of cooperation on such matters as engineering, radio, weather reporting, and even advertising. Such a program has been so obviously desirable for the industry for so long a time it seems almost unbelievable that it was finally so simply effected. Score up one big feather for the cap of the Authority.

What a lot of nonsense there was in the Post Office's re-decision to reverse itself on giving Eastern Air Lines a contract on the Brownsville-Houston-San Antonio route. As we reconstructed the whole second battle of the Alamo in this department last month, we ended on the note that "reason finally prevailed and the Post Office announced it would leave the matter up to the C A A." Then, just five days before the C.A.A. took office, Farley's new Air Mail Director, W. W. Howes, overruled that announcement and Eastern Air Lines was given its contract. Braniff, of course which operated non-mail schedules over the same routes, early enough to qualify under the "grandfather clause", must be given a certificate by the C A A. Now presumably Eastern must also be deemed to be flying between the cities in question "in the interests of the public's convenience and necessity."

National Air Travel Week seems to be building up into a project whose success is certain. The C.A.A. has endorsed it, as have many local associations and political big shots. Whether the President will go on record for it seems doubtful at this time, but that is probably not very important. Checking with various air lines, every traffic office in the country seems to be working up enthusiasm and planning good publicity and sales tie-ups. Best idea yet seems to be the project to have all the lines arrange short sight-seeing trips at each terminal, with the object of getting some 50,000 potential air travellers into the sky on their first flight.

It's getting certainer and certainer that North Beach Airport is going to become New York's principal air line terminal. Both United and American are talking leases for space in the three huge land plane hangars already under construction. In addition, Mayor LaGuardia late last month put through another appropriation of $7,282,000 to push construction of three more land plane hangars and to extend the main runway from approximately 5,000 to 6,000 feet. The seaplane channel in Flushing Bay is also to be widened another 700 feet beyond the limits called for in the original layout to facilitate the use of the base by trans-Atlantic craft. Newark is still in there fighting, and has also appropriated funds for field improvements but general air line reaction seems to be that it is a mere locking of a well-robbed stable.

Log Entries. Bermuda business is picking up. Imperial announces that 77 9 per cent of the Cavalier's capacity was sold out during August, an improvement of about 35 per cent over last year. . . . American Airlines has promoted J. F Martin to the post of Superintendent of Maintenance, and Frank A Ware, former superintendent of Maintenance at Forth Worth, to the post of Assistant Superintendent for the whole system, the post formerly occupied by Martin. . . . Mid-Continent Airlines, filing data with the Securities Exchange Commission for permission to market 40,000 new shares of convertible preference stock at $2 50 per share, discloses that for the year ending June 30, 1937, its net loss was $107,080 85, while for the year ending June 30, 1938, the net loss was $99,293 56. . . . Chicago & Southern has filed an application with the C A A for a certificate permitting an extension of service between Memphis and Houston via Pine Bluff, Ark, and Shreveport, La. . . . Eastern Air Lines has added Edward C Romfh, Miami banker, to its Board of Directors. . . . Pan American Airways has signed a lease with the Golden Gate Fair people for 65,000 sq. ft. of space in the Hall of Air Transportation. During the Fair, the trans-Pacific clippers will be overhauled and serviced behind glass panels within full view of Fair visitors. . . . American Airlines is pretty proud of its Labor Day week-end traffic. September 2nd, its Newark terminal handled all regular schedules plus fifteen extra sections. More than 1,100 passengers were handled by W H Miller, and his crews. . . . TWA has appointed J. H Clemson, former district traffic agent at Philadelphia, as district manager for New York. American has appointed A Martin Logan, formerly with General Air Express, as its Washington representative.



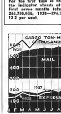
AIR TRANSPORT INDICATOR

September 1, 1938

102.1

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during August 1938, to the corresponding figure for August, 1937.

For the first time in three months the indicator stands at over 100. First seven months totals: 1937—263,750,000; 1938—296,350,000, up 12 2 per cent.



CITED: Major Carl F. Greene.

CITED: Professor John Younger of the University of Maryland

CITED: Captain Alfred H. Johnson.

SCOUTING THE SQUADRONS

Notes and Comment on our Air Defenses

Lockheed XC-35 project wins Collier Trophy for Air Corps

Way back last Spring, this department expressed its own admiration of Wright Field's sub-stratosphere (or as it prefers to call it high level) research. What hit us in the eye about the project was not merely its success, but the way in which the War Department so promptly gave permission for publishing the results. Without a doubt, such action speeded the progress of air transport design by many months.

Certainly the Committee appointed by the National Aeronautic Association to decide this year's winner of the Collier Trophy seemed to think so. Faced with choosing from among 35 outstanding nominations "the greatest achievement in aviation whose value has been demonstrated in actual use during the previous year," it awarded the trophy "To the United States Army Air Corps for having designed, constructed and completely equipped the XC-35 Sub-stratosphere plane, the first pressure cabin airplane to be flown successfully anywhere in the World."

Major Carl F. Greene and Captain Albert H. Johnson, both of the Army Air Corps, stationed at Wright Field, and Dr. John E. Younger, formerly Aeronautical Mechanical Engineer of the Material Division, Wright Field, and now professor of engineering at the University of Maryland, College Park, Md., were cited as Air Corps principals in the research and development work which resulted in the award. Major Greene initiated the project and was the supervising officer. Captain Johnson acted as test pilot and assisted in the engineering. Dr John E. Younger was responsible for the technical aspects. In addition, Lieut. Colonel Oliver, P. Echols, Chief of the Engineering Section of the Material Division, Air Corps, Wright Field, was cited as administrative officer under whose executive direction the research was carried on.

It was the fourth time Army airmen won this trophy-of-trophies. In 1924 it went to the service as a whole for the Round-the-World-Flight. In 1926 it went to Maj. Edward L. Hoffman for his share in the development of the modern parachute. In 1934 Maj. Albert Hegenberger won it with his improvements in blind flying technique.

Not even breathing hard, the Navy moved two patrol squadrons last month through "routine deliveries" that would have been front page stuff a mere two years ago. Sept. 2, fourteen planes making up Squadron Five arrived at Coco Solo, Canal Zone, 26 hr. and 40 min. of flying time out of San Diego. Strong headwinds had required a precautionary layover in the Gulf of Fonseca 550 miles north of the squadron's final destination. Flight commander was Lieut. Comm. W. K. Berner. Sept. 7, seventeen planes comprising Squadron One dropped into Pearl Harbor, Hawaii, after a 17 hour and 21 min. crossing from San Diego. Lieut. Comm. A. P. Storrs commanded.

Speaking of trophies, a naval air reserve station and a naval air reserve division went to town last month in celebration of copping off rewards in their own right. The Oakland, Calif., base had been announced the winner of the Edwin Francis Conway Memorial Trophy awarded annually to the base given the highest rating by the inspection board. The First Aviation Division VS-12R Squadron of Kansas City, Kan., had been announced as winner of the Noel Davis Trophy awarded annually to the division at the top of the inspection board's list.

Fragmentations. The 27th Pursuit Squadron from Selfridge showed off its eighteen new Seversky P-35's. Marine Fighting Squadron One showed its trim F3F-2 Grummans. The Navy had prop trouble and sent regrets. Thus briefly, a summary of the services' share in the Cleveland Races.

But mention must be made of the strong contrast between the last-minute freshness of this year's equipment and some of the equipment shown other years. And the grade of flying also deserves a big hand—especially since its emphasis was uniformly on formations and evolutions which form a real part in the flyers' military preparedness. . . . The Air Corps, after first announcing it would mass its entire GHQ over the American Legion jamboree at Los Angeles, took another look at its training program and cut down its show to a massing of bombers, including the XB-15 "super-fortress" now in service at Langley Field. . . . Gen. Delos Emmons took 40 of his First Wing bombers and attack planes north on an extended trip of the Pacific Northwest last month. Some 290 officers and men took part in the movement. . . . Belief that the Army will put on a concerted drive for funds to build a big Alaskan air base has become stronger since Asst. Secy. Louis Johnson's return from an extensive survey of the Territory. $10,000,000 was asked for last year but was diverted for uses Congress thought more pressing.

AVIATION'S OPERATORS CORNER

Tegging the Beses with

LES NEVILLE

A new deal for the private flier seems to be in the offing. The long vacant job of chief of the P F division has been given to Grove Webster, publisher of the Airport Directory and an officer in the N.A.A. and P F A. Announcement of the appointment was made August 31 by C A A. Chairman Edward J Noble. It all began way back when Denis Mulligan was Chief of the Air Commerce Bureau. The woods were full of indignation meetings of non-scheduled operators last winter. All over the country the boys were demanding representation for their taxation and the Bureau decided it was time to do something about it. So they created the department but never got around to appointing its chief. Then the C A A. took over and got busy. Non-scheduled operators are much encouraged. Back in Hackensack, N. J, Trevor Faille, who has worked with Grove on the Airport Directory for the last seven years, takes complete charge of the publishing project.

C A A. is also hopping on the airport problem. A nationwide survey of airports has been started by the Planning and Development Division by two special staffs under the direction of Richard C Gazeley, Chief. One group will collect information from the field, the second will assimilate and analyze it. The field group is directed by Major A B McMullen, Chief of the Airport Section, and formerly Florida's Director of Aviation. The survey is under the supervision of Administrator Clinton M Hester. A report to Congress on the advisability of federal participation in the development and operation of a national airport system is required by February 1, 1939, under the provisions of the Civil Aeronautics Act.

Feast with the Seabirds, if you are a seaplane pilot and need base facilities down around Bristol, Pa. Fleetwings, Inc., have taken out a license for an authorized repair station at their factory base and offer the facilities to the public. Storage gas, oil, and service, as well as use of the company cafeteria are available. The location is on the Delaware River, ten miles south of Trenton, N J.

Taylorcraft stepped out and took several awards at the races conducted in conjunction with the Michigan Air Tour. In the Bernarr Mcfadden Trophy Contest, first place went to Ralph H Barry, Saginaw; second, Lee Lathrop, Escanaba, and Ralph Lee, Detroit, and Miss

FORGOTTEN FLIERS' HOPE: Grove Webster is now securely sandwiched between the private fliers and the C.A.A. He fills the long vacant appointment to the Private Fliers division.

Merian Weyant, Lansing, third, all flying Taylorcraft. First and third places went to the same make of ship in the races at Ionia, Mich., July 17.

Bad Pack Airport changes hands according to advices from Franklin T Kurt, secretary of the operating company. After thirteen years of active association with the field, Jack Casey, Manager, has sold his interests and Walter R Laudensleger takes over in cooperation with Gilles Aviation Corp, of Hicksville, L. I.

N.Y.S.A.O. members will be pleased to hear of the reappointment of Maj F. W Bonfils and John H Stark, both of Denver, to two year terms on the state aeronautics commission. Appointments were made by Governor Teller Ammons.

Schley Field, New Jersey's Pimira, has been busy this season as usual. Climax was a three-day state championship meet over Labor Day weekend. Harry Wightman, Upper Montclair, carried off the title for the third consecutive year and led his organization, the Aero Club Albatross, Irvington, to victory in the team competition. Second in individual standing was Stanley Hruslinsky, Bloomfield, representing the Y Flying Club of Newark. Herold Gehling, Plainfield, was second to Wightman in the Bomb Dropping Contest and Steven Orbun, Hillside, in the spot landing event.

Carl Friedlaender becames a publisher with the first issue of the "Aeronca Grapevine" which gives all the gossip on the activities of Aeronca owners here and there about the country. From it we learn that newly appointed Aeronca District Managers and thier territories are: Jones & Humeston (Van Nuys, Calif.)—California, Nevada, and Arizona; Ivan Hillyard and Robert Stillwell (Evansville, Ind.)—Southern Indiana, Southern Illinois, and Western Kentucky; O. E. Dickerhoff-Kansas and Oklahoma; Ray Vaughan — Northern Ohio; A. Elliott Merrill and Gilbert Cook (Seattle — Washington, Oregon, and Northern Idaho; John T. Corrodi (Columbus)—Central Ohio; Inter City Airlines (Boston)—New England.

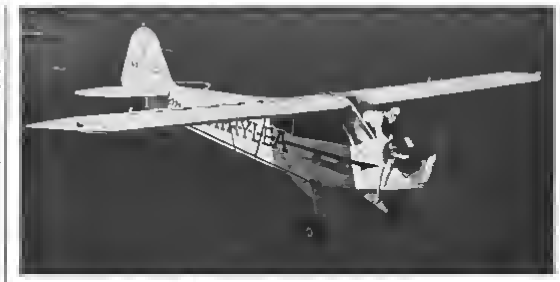
SUBMERSIBLE RAMP. At the Newark Seaplane Base Vits Marienne demonstrates his portable ramp which submerges and picks up a seaplane fully in 30 seconds. A turntable is included.

Seventy-nine pilots and passengers, and **eleven lightplanes participated** in the actual competitive events of the first Annual Western Lightplane Meet and Races was held at Monterey, Calif., September 4th, under the sponsorship of the Monterey Peninsula Aviation Club, headed by Cliff Reynilds. Approximately 5000 spectators turned out for the show. Cross-country, closed-course, and novelty contests were staged for the competing lightplanes. Results were as follows:

Cross country race, Salinas to Monterey: 1. Cale Cook, Taylorcraft-Continental 40; 2. L H McCurley, Porterfield-Continental 40; 3 Clare Coe, Piper Cub-Continental 40.

Watsonville to Monterey: 1. C. C Brayton, Aeronca-Continental 50, 2 Charles Cornwell, Aeronca-Menasco 50; 3. George Andersen, Buhl Pup-Zekely 45.

Fifty hp. four lap closed course race: C C. Brayton, Aeronca-Continental 50, 1st; Clyde Schlieper, Piper Cub 50, 2nd; Jack Peacock, Taylorcraft-Continental 40, 3rd. Novelty contest: Jack Peacock, 1st; Charles Ryan, 2nd, A Whisman, 3rd. Closed course three lap race for Piper Cubs: Clare Coe, 1st, A. Whisman, 2nd, Charles Ryan, 3rd.



MAINTENANCE ALOFT: Trying to replace a spark plug terminated the endurance flight of Merrill Phoenix and Herold Allen, at Syracuse, after 103 hours in their Franklin powered Piper Cub.

REPORT CARD

Of Air School Developments

Ryan has reduced tuition and shortened courses as a result of a survey of employment conditions in the aircraft industry and a suggestion of the Bureau of Air Commerce to shorten the general time qualifications for airplane and engine mechanics. The Master Mechanics course is now nine months instead of twelve and the total enrollment expense is now $495. A similar reduction of $130 becomes effective for the Combination Flight Training and Master Mechanics Course and will apply in the case of students combining the nine months mechanical training with instruction for the Commercial, Limited Commercial, Private and Solo flying courses.

You can learn short cuts from our old friend Commander P. V. H. Weems in either New York or Philadelphia. Night classes in the Weems System of Navigation will be given on Tuesdays, beginning October 11, at the Franklin Institute, Philadelphia, and on Wednesdays beginning October 12, at the Hayden Planetarium in New York. Major subjects covered are Dead Reckoning and Celestial Navigation.

107 placements out of 154 graduates is the record of last 12 months for the Boeing School of Aeronautics. Twenty-six companies are employing these men. In the summer graduation exercises twenty-six graduates, three from Canada, were awarded certificates.

N. Y. U. will turn out meteorologists after a new department devoted to research and training for weather forecasters gets going this month, according to a recent announcement by Dean Thorndike Saville, Chairman of the new department, an outgrowth of courses started several years ago by Prof Edmund Woodman, is Prof Athelstan F. Spilhaus, Gardner Emmons, of the U. S. Weather Bureau, has been appointed assistant professor.

A few brain teasers have been added to the engineering course at the Aeronautical University Inc., in Chicago. They are Metallurgy, Acoustics, Heaviside Calculus, Friction and Propeller Design. Aeronautical University approaches its tenth year and in that period has had an annual enrollment of 300 students.

Another school for California has appeared on the horizon. The Western Air College, operated by old-timer K. C. Hawkins, is located on Alhambra Airport, former Western Air Express terminal on the Los Angeles East Side. The school reports ground and flying activities already under way at a good level with courses in sheet metal work, aircraft and engine mechanics, and courses including blind flight work.

ENGINEERS CORNER: Where Stanley H. Evans directs engineering training at the Ryan School of Aeronautics.

Men With Very Very Small Wings

(*Continued from page 21*)

Not the least of the Goon's fine points is its two-pitch French Ratier propeller. In this country to date insufficient attention has been given to propeller design in the light in-line class to match the best European practice. The Goon also reaps a safety margin through the two-pitch Ratier feature, which provides faster take-off. Chester has a host of minor design improvements in the Goon including a new type of louvre exhaust for cooling air out of the engine compartment. This latter feature calls to mind a recent NACA report (by Donald Wood) commenting that approximately 60 per cent of energy consumed by flow of cooling air through the best baffled air cooled engine compartments is wasted *after* the cooling air has done its work.

Turner's racer, which finally came through in a major speed event, resembles the Chester Goon in having a mid-wing mounted symmetrical wing. Like Wittman's Bonzo, Turner's racer has fixed landing gear and there is probably another 20 m p h in the Turner Special if it can be fitted with retractable gear.

After seeing in-line engined racers win in 1936 and 1937 it is significant to note that the Thompson 1st and 2nd places this year were taken by radials (P & W Twin Wasp and Wasp Jrs.) and 3rd by Wittman's ancient Curtiss D-12 racer. Also that two of the first three planes were equipped with fixed landing gear and one (Wittman's) with externally braced wings. This situation again emphasizes the varying approaches to speed efficiency (k) open to designers and illustrates the fallacy of clinging too closely to any one design formula.

A surprise at the meet was Leigh Wade's semi mid-wing racer, the original Time Flies, rebuilt by Military Aircraft Corporation. This ship showed ease of handling and excellent top speed. In general design it closely resembles the Turner racer, but is equipped with retractable gear.

We judge, from considerations of the mid-wings, Turner's Special, the Goon, Wade's Racer and Wittman's Bonzo, that mid-wing racers will increase in popularity.

The Mr. Smoothie is a high mid-wing type as is the Folkerts racer. But there should be just a shade more efficiency for the true mid-wing and there is much better vision for the pilot, especially in landing. The low wing racers which have been exemplified by Rider's designs, are a bit tricky getting on and off the ground and have a less efficient wing root filleting due to placing the wing at the bottom of round or oval fuselages requiring fairly large fillets and giving evidence of induced drag from wing fuselage interference. We think the symmetrical airfoil for high speed is here to stay.

Racers in Order of Efficiency

Speed		K
352	Hughes	168.4
300	Goon	172.4
300	Schoenfeldt	165 3
287	Mr Mulligan	162 8
272	Brown Special (Miss Los Angeles)	182.4
275	Delgado Flash	157.2
280	Crosby CR 4	152

After considering the design excellence of the 1938 crop of racers one wonders what further corners can be cut to up future efficiency figures. We know what some of the boys are thinking about and hope to see some of the following developments between now and the 1939 Nationals.

1. More use of controllable or constant speed propellers, especially in the Greve class where some of the boys may follow Art Chester's lead and get Ratier propellers.

2. Slots, slotted flaps and Fowler type flaps have not yet been applied to racers. This sort of thing seems a logical next step and we look forward to some safer landings as a result.

3. We believe radical changes will be made in design of engine cowlings, perhaps on the in-lines particularly. There seems some promise of improved cooling efficiency for both radials and in-lines through experimenting with the reverse-flow nose slot exit type cowling which the NACA has been testing.

But for the in-lines we think there is more promise of improving both speed and cooling for the Greve class in-line powered racers through adaptation of the De Haviland type cowling in which the nose is kept perfectly smooth while cooling air enters through scoops on the wings, flow over the engine from front to rear, and exhausts through a controllable flap at the lower rear of engine compartment.

Another promising development, especially for take-off and pylon control, is use of the twin-concentric oppositely rotating propellers such as have been flown by the Machi-Castoldi, the new Koolhaven fighter and a current U. S. Army experimental fighter.

A final improvement we spot on the horizon is use of short wave radio receiving sets by the race pilots. Such equipment would permit the ground crew to serve as a board of strategy, advising the pilot of his position, speed, etc.

We know Art Chester is studying the radio idea, and also the problem of reverse flow cooling. In this connection it is significant to note that year by year the major performances come from racers two or three years old which have been flown enough to permit proper timing and detailed refinement. Such has been the history of the Turner Special, Ortman's Marcoux-Bromberg, Wittman's Bonzo and others.

We have been able to obtain information needed to follow Chester's Jeep through a career of six consecutive years and the results show conclusively that it is not necessary to build a brand new racer to get either higher speeds or higher factor of efficiency. In six seasons, the little Jeep, with engine changes only (from 190 hp. to 300 hp.), the K factor advanced approximately 30 points in this time from 112.3 to 142.5.

If Roscoe Turner can show the same ratio of improvement we will see 300 m p h. broken in the 1939 Thompson. And the speed limits, as well as the K limits still seem somewhat in the future as our race plan designers gather new momentum.

Next year Mr. Smoothie should be in shape to pace Turner, and next year the in-lines, after a thorough coat of design polish, may come back to regain their lost speed laurels.

We have one final plea—all in the name of K. A determination of correct relative speed efficiency depends on exact determination of maximum straightway speed. For this purpose we urge return of the 2 way 3 kilometer dasher—with liberal prizes to encourage a display of the actual all-out speeds of our race planes.

On basis of best *recorded* top speed over measured course.

Simplify Maintenance Through Design

(Continued from page 25)

conduit, in all, about two or three days work for one man In this case it would have been just as practical to install controls etc. on structural members, and install two easily removable floor panels, in the same manner as the cabin flooring The same idea applies to installations of lines, ducts and controls, everything should be removable without the necessity of disturbing adjacent parts Here as well the matter of fastenings, demands serious consideration. The use of screw plates, of any type, whether of the fibre anchor nut type, or otherwise, is recommended, so there is no need to use more than one wrench etc at a time, to remove the fastening screws or bolts Fibre locking nuts, or any of the popular self locking nuts, are vastly preferable to cottered nuts, as more time is spent cottering nuts in inaccessible places than their importance demands To the author's knowledge, he has yet to see a self locking nut that loosened unless the installation was one that demanded a cottered nut

Instrument installations are generally accessible, but the lines and fittings from them are not generally so situated Manufacturers should not try to make a permanent assembly of all lines, both instrument and fuel but should so manifold them that any section of each can be easily removed or reached. Lines are best grouped and fastened, that interference from local vibrating members etc does not cause either frequent replacement, or the need for extensive wrapping or shielding to prevent wear. All line fittings are best staggered so each can be removed without the adjacent one interfering with the wrench, or causing bending of the line for ease of fitting removal

Engine and surface control cables are a source of annoyance to most maintenance crews, due mostly to the designer's desire to have them run through blind structure, and through complicated routings rather than the fact that replacement is frequently necessary, which is seldom the case Inasmuch as control cables require some frequent adjustments in service it is very important that all turnbuckles or adjusting ends, be easily accessible, for most turnbuckles stick at the wrong time, such as when a fast adjustment is needed It is best to have cable installations visible for inspection purposes, throughout their entire length, and to keep cables out of blind sections Good fairlead and pulley alignment is an absolute necessity for long cable life, and some designers have forgotten that plain bearing pulleys were obsolete years back Ball bearing pulleys are far superior, even if loads are very light and movement slight A turnbuckle at each end of the cable is a splendid idea, on some installations, especially those of great length or those which demand a large adjustment range

The pressing need for the smaller passenger lines, is a seat and back arrangement for chairs with the covering applied in such a manner that the operator can do his own reupholstering without the necessity of skilled help Something along the line of screwed on panels and covers should do Plain seat coverings are vastly preferable to fancy welted affairs, for welts or beaded covers quickly wear through and are hard to repair Passenger cabin wall and head covering, in all cases should be applied in easily removable panels, fastened with machine screws to some sort of anchor nut. Wood and self tapping screws are all right, but not suitable if they are to be removed often, as each time a larger screw is necessary. Backing for upholstered panels should be of some waterproof material as plywood in some installations is easily wet which causes decay, unless means are taken to prevent it Water proof soundproofing is something that all operators have sore need for, inasmuch as water is bound to leak in somewhere and the present types of soundproofing material soak up many times their weight Water pickup is a grave problem aside from weight, in most cases corrosion of the skin and members is found, and if dissimilar metals are present the corrosion is all the more severe While the present types of soundproofing are most effective when cemented directly to the skin, many locations are better fitted to the removable upholstery panels, in order to have free access to the skin and members

A safety belt that does not need an engineer to apply is needed, as some of the cam lock types now in use, baffle the average passenger The use of the cam lock for ease of adjustment, and the old style clip for ease of fastening, is worthy of application. The use of metal window trim rather than wood is good practice, for collected moisture from cold windows runs down, soon ruining both finish and wooden trim An easily installed chair that does not need forcing into place on installation is an essential

Ventilation and heating systems are the bane of most operators, for there are few if any ships that are satisfactory as built Invariably heater controls and ducts are flimsy, seldom stand up well, and require considerable going over by the operator, before being satisfactory for his use. Heater controls should be as sure in operation as engine controls, and built to the same standards, for long service life Ducts and valves, engine intensifier tubes, boilers or lines, all have need to be well built, for this item is one of those which demand maintenance out of proportion to their value.

Engine installations, for the most part, are satisfactory in that quick changeovers can be accomplished but cowl and duct design has lagged, from the long life view. Most of the cowling on the average run of light transports is far too light in construction, and the same applies to air ducts, carburator heaters and such Cowling for light transports should be designed with the following kept well in mind, first, ease of removal, and speedy installation, second, ruggedness, freedom from overhanging unsupported sections which vibrate and crack, and lightweight trick fasteners Third, ease of replacement of worn parts, and the ability to replace worn sections from flat sheet, without the necessity of forming double curved sections

Cowling design is important in the light transport field, for with most operators, ship work is being done up till scheduled departure time, and cowls that are quickly installed leave just so much more time for more important maintenance functions With last minute engine adjustments the rule there is no time available for fooling around with cowl installations Quick acting fasteners, and the elimination of turnbuckles, for securing speed rings, are subjects worthy of thought All cowl fasteners have a tendency to wear early in service, due to vibration, and if this is not to become a problem, there is need for ample fixity at all fasteners to prevent this wear Heater tubes and ducts, engine baffles and the like, demand ample fastening, if premature wear is to be eliminated. The use of bolt or screw fastened assemblies is prefer-

(Turn to page 74)

Simplify Maintenance

(Continued from page 72)

able to slip jointed affairs, for all slip joints loosen, causing rapid vibrational wear. Exhaust systems of stainless steel, as in general use at present, cause few maintenance difficulties, so operators are seldom bothered with the problems of a few years back, attendant with the use of plain steels and iron.

Present day use of retractable landing gears particularly those of the mechanical or electrical types, have caused much maintenance grief. While hydraulic systems have their own inherent difficulties, they are seldom used on light transports, but give way to mechanically operated gears which seem to have incorporated numerous troubles. Designers should steer clear of complicated mechanisms, even at the expense of weight, or sped of operation. The presence of dirt, ice, excess grease or oil, should not interfere with proper gear operation, whether the temperature be hot or cold. Where the use of heavy lubricants is necessary, as on screws, gears and sectors, slides, etc., proper allowance should be made for lubricant drag under both cold conditions, and lack of sufficient lubricant. The use of lighter lubricants during cold weather is not always feasible, for if ships are in and out of warm hangars lighter lubricants tend to run off, necessitating regreasings, etc., before each flight.

A mechanically operated landing gear, either hand or electrically operated, should steer clear of friction stops, clutches and the like, or any such devices designed to take a heavy shock load for their ability to stand up consistently under service conditions is very doubtful. The use of brake lining for friction clutches as stops, near oil or grease is bad policy, for the average type lining absorbs such, tremendously increasing its frictional coefficient, to the detriment of the operating characteristics. This often causes such facings to grab, and hold, causing damage to the components of the retracting mechanism which trouble has often occurred on one popular light transport. Bowden wire indicators for wheel position and other uses, is generally troublesome due to broken piano wires etc. The use of electrical warning and indicating systems is far more satisfactory, and properly designed limit switches make adjustments an easy matter.

Designers in planning retractable landing gears for their ships, should always allow for a standard sized bushing at each joint, regardless of load or angular motion. Standard bushings, easily obtainable and installed, allow maintenance men to keep gears within proper clearances, without expense for worn fittings, bushings being cheaper. In using ball roller or needle bearings, in magnesium or aluminum alloy fittings etc., where press fits for the outer races are used, it is good policy to have the bearing press into a locked steel collar in the softer alloy, especially if there are heavy radial loads. Such loads on bearings, tend to compress the alloy, causing premature race looseness. This condition is especially troublesome in the use of magnesium alloy wheels.

Radio installation, generally a problem need not be, if care were taken to centralize equipment, in positions that allowed of free access, without the necessity of removing structure or interior trim. Openings for conduit and leads should allow personnel to work on same without removing floors etc., especially when sets are floor mounted, and the leads and controls run beneath the floor, to control panels in the cockpit. It is good practice to keep sets away from control cables, gas lines etc., for many reasons. Since radio personnel are sometimes unfamiliar with uses of cables and lines they are likely to cause damage to same while working on their equipment, and as the equipment makes use of high voltages, there is always danger of a short affecting other installations. Working room around radio installations is very desirable for air tuning, and fast servicing if needed. In another light, radio equipment is best segregated, for if airplane personnel have to remove it to service airplane items, they frequently do damage, either physically to the equipment, or change adjustments, either of which calls for unwarranted work on the part of the radio crew. It goes without saying, that all items in the radio line should make use of quick connector plugs and mounts, to expedite removal or installation, and obviate the use of soldered temporary connections or makeshift mounts.

Despite the fact that present day light transports have many aerodynamic advantages lacking a few years ago, ease of maintenance has not kept pace as well as might be. Chiefly this is concerned with many of the minor installations, which while relatively unimportant in themselves, consume more then their share of maintenance time. Their perfection will leave the allowance of more time for far more important maintenance functions which many operators are at present unable to handle in a manner best suited to their needs.

Engineers

(Continued from page 23)

come acquainted with them by gradual processes he will entirely lose the fear that leads many college students to dodge the more "advanced" subjects.

This reasoning applies particularly to the problem of speeding up engineering education. It may take two years, by usual methods, to cover college math through calculus but it would not take two years to cover the basic principles of each branch up to that point. This is all the more important to the engineer who rarely has to make use of the more complex forms of mathematical theory and consequently tends to forget them anyway. Besides there are always plenty of high-powered mathematicians to be called in on special problems just as the general physician calls in specialists to help him diagnose a difficult case.

There are many other things that can be done to streamline the engineer's education, or at least that part of it now commonly covered by four or five years in a university. The most important, however, can be summed up as follows: (a) elimination of non-technical subjects (b) intensification of working schedules (c) specialization within the technical field, (d) revised methods of teaching. To this might be added the general idea of emphasizing the fundamentals of engineering, leaving the more complicated engineering subjects to be learned through experience.

There still remains that question about the cultural background. To argue that such a background is not desirable would be foolish indeed. Even our present college system falls far short of producing cultured and clear-thinking individuals. But why assume that a man's cultural development must be attained during a certain specified period of his life, and at a time when he is mainly interested in improving his economic situation? Why not help him get on his feet as quickly as possible, so that he can sooner reach the stage in which he can begin to think about something besides the next payment on the car, or how much it costs to have a baby!

Finally, it begins to look as if the best answer to our modern educational problem would be not only to get the future engineer into his work as quickly as possible, but to give him a better chance to continue both his cultural and technical education after college. This may be "adult education", but it is not the kind in which a miscellaneous group of middle-aged people gather together for a series of talks on everything under the sun. The idea of professional training for adults is not new and must have some practical merit, as shown by the modern trend toward the establishment of schools and training courses within various large commercial concerns. It is strange that the colleges themselves seem to take such an indifferent attitude about their graduates. The general idea seems to be that alma mater has made the man what he is in four short years and that he therefore owes his college something. But what about the years the man is going to spend after he leaves college? Is there no chance for him to improve his technical knowledge, or to broaden his outlook on life? This seems to be the period that we are overlooking in our educational system.

Of course, as long as things are run on the present basis it would probably be foolish for any boy to give up the opportunity to spend four years under pleasant circumstances, to join a good fraternity, to go to football games, play tennis, and attend Junior Proms. It would be foolish to the extent that he might never again have a chance to enjoy himself so much or to come in contact with such interesting people. But there should be no illusions about the economic value of these four or five years. They are not going to eliminate the next four or five years of development required to round out the engineer's education. Unless the boy is unusually lucky or financially well-heeled the chances are that his wife and children will feel the effects of those years spent in obtaining a higher education. For that is the final factor that must be considered: most men don't want to wait until they are thirty before they marry.

Summing it all up, there is no argument about culture, there is no argument about the need for higher education; what seems to be needed is a readjustment of our entire educational system. Why not put the horse before the cart and fit our young people for really good jobs at an early age and then see that they have an opportunity for both professional and cultural development? Streamlining education does not mean cutting down on education. The streamlined airplane contains many more things than it did in the "stick-and-wire" days. The only difference is that we have arranged things so that they offer the least resistance to speed. Why not arrange our educational programs so they will offer least resistance to economic progress?

MEN *"in the know"*

KNOW *Roebling Control Cord*

IN PLANNING and "seeing through" production on a great fleet of modern planes, every obscure accessory must pass the keen eye and rigid specification tests of the Project Engineer.

Because of the high degree of safe, dependable service which Roebling Control Cord assures, you will find it is the choice of project engineers in charge of building most of the nation's great air fleets

Roebling Wire Aircraft Products are made in Stainless Steel and High Carbon (Tinned or Galvanized) Steel They include Aircraft Wire; Aircraft Strand, Aircraft Cord (6 x 7, 7 x 7, 7 x 19), Ferrules and Thimbles, Serving and Locking Wires, Control Strand and Casing Compressed Fittings for Attachments, Power and Lighting Cable, Welding Wire

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KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

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KOLLSMAN INSTRUMENT CO., INC.

8008 FORTY-FIFTH AVENUE • ELMHURST, NEW YORK

WESTERN BRANCH: GRAND CENTRAL AIR TERMINAL, GLENDALE, CALIFORNIA

Used Planes

for sale—Grouped by Make

See index for additional planes offered in other ads. Ads appearing in group form are keyed to indicate that they also cover P—Parts T—Trades W—Wanted

Aeronca

AERONCA C 3 Deluxe two doors brakes high gloss yellow like new throughout. Fastest Aeronca in east Other extras. Mfd 1936. Price $785 00 Can finance about half. Located eastern N Y FS 450, Aviation 330 West 42nd St, New York City

AERONCA, C 3 Collegian lots 34 Engine just overhauled—modernized Like new condition Fab & finish excellent Has brakes. Red & Yellow $700 Aeronca Sales Albany Airport, Albany, N Y.

AERONCA LOW WIND 70 H P, flap, landing lights less battery, 610 hours total, 390 hours since major, excellent condition $1400 00 K C A Aeronca, brakes, tail wheel pants, 250 hours, perfect condition $1400 00 Time payments acceptable Tred Avon Flying Service Inc, Easton Maryland

AERONCA "K" 1937 model only 180 hours $985 Aeronca C 3 with brakes $725 1935 Aeronca C 3 $450 Terms arranged Pioneer c/o Airport Syracuse N Y

American Eagle

AMERICAN EAGLE—OX 5. Ship flown ten hours since completely rebuilt and recovered Motor overhauled new propeller—$325 00 Frank Headley Jr, Lincoln Park, New Jersey

KINNER DELUXE AMERICAN EAGLE, refinished, recovered reflector ring steel propeller duals Licensed wonderful condition Your loss to cagiest this sacrifice Terms $595 00 Nelson Merriam 1211 N Lexington Hastings Nebraska

Arrow

ARROW V-8 MASTER, compass brakes, tailwheel, lights airspeed 20 hours total, modernized water pump large crankcase, gullwings Licensed March 1939 Best used Arrow available Best cash offer takes it. J Welse Jr 230 Park Ave., New York City

Cessna

J 9 WHIRLWIND CESSNA landing gear slightly cracked propeller bent Can be repaired for $50 or less. $500 cash Jesse Boland Farmville, Va

Corbin Baby Ace

CORBIN BABY ACE, 35 HP Dayton Aero engine Sell or trade for two place $275 00 Picture 10c Russell Schuetz, Waukesha Wisconsin

Curtiss, Jr.

CURTISS WRIGHT JR Licensed till March 15 1939, Winter enclosure Motor, gastank cowled New propeller with spinner. Latest pusher built $385 00 Cash Dilbert Drew 2305 Castellor St, Omaha, Nebraska

Fairchild

FAIRCHILDS "22" with inverted Cirrus engine, special equipment $1200 Fairchild "22", Kinner powered $850 Fairchild "24" model C H C $2200 Pioneer c/o Airport Syracuse, N Y

Howard

HOWARD DGA 9 Jacobs 285, built February 1938 125 hours total time, like new, extra night and blind flying equipment, two way radio Represents $11,660 will take $9 000 FS 453 Aviation, 330 West 42nd St New York City

INDEX

AVIATION "Classified"—October, 1938
Undisplayed ads offering only ONE make of plane are grouped under that make. Others appear under "USED PLANES—General" and are numbered and indexed to enable readers to conveniently locate the makes of planes offered or other items of interest. All other undisplayed and displayed ads—excepting those relating to employment and business opportunities—are numbered or referred to by number, and indexed for the reader's convenience in quickly finding ads.

Used Planes

Laird

LAIRD—SPOLB Wright J-5 new ship assembled 1 1 38, many extras total time on ship 160 hours price $2250.00 J B Hatch U S Yards Chicago

Loening

LOENING COMMUTER AMPHIBIAN J69D Ship and engine completely majored, licensed July 1939 400 hours total time Never salt water $2000 00 Trades accepted Douglas Burton, Lake George, New York (T)

Roamair

FOR SALE OR TRADE One Wright 220 HP metal clad Crop Duster just covered Motor fresh Major and relicensed Roamair Biplane 8 50 12 tires brakes No load or aerobatic restrictions. New steel propeller Big hopper Steerable skid $1450.00 C T Jensen, 1427 52 St. Sacramento California (T)

Robin

CHALLENGER ROBIN Clean throughout and in good condition, little time on motor since majored Yellow and black Write for details. (Licensed) Norwalk Air Service, Norwalk, Conn.

Sikorsky

SIKORSKY S-39 Just licensed, blind flying instruments, 28 hours since major never in salt water, always privately owned 410 total hours. Must sacrifice immediately. Dr Young, WDGY Minneapolis Minn

Spartan

FOR SALE OR TRADE SPARTAN C-3 J 5 motor and ship rebuilt from ground up New cover, new propeller starter Brakes tail wheel—turn bank air speed Ship like new. Rebuilt at a cost of $900 00 Special paint job red cream No time since rebuilt Ready for sale September 30 George Graffunder Gaylord Minn (T)

Stinson

STINSON SR-5A late 1934. $2500 00 worth of extra equipment, two-way radio Total time 350 hours no time since major 245 Lycoming new Smith Controllable. Beautiful condition, special throughout Will sell with or without extra equipment or accept trade on Fairchild 24. James R Harrington Mansfield Ohio (T)

STINSON 1937—SR—9B 5 place, less than 60 hours total time Lycoming 245 HP automatic rocker arm lubrication, Smith electric controllable propeller latest RCA radio bank turn, vertical speed sensitive altimeter, thermocouple flares generator, landing lights, apply Bob Coleman, Stickney Airport, Toledo Ohio

STINSON SR8B 245 Lycoming Dual Wing delivered from factory January 1937 High rubbed finish all over red trimmed in black Total time 263 hours private flying only Never damaged original throughout and in like new condition Hamilton controllable propeller Eclipse generator bonded shielded, Sensitive altimeter turn and bank manifold pressure built in fire extinguisher etc This is the Deluxe job with full grained panels and genuine leather upholstery Prepared for night equipment Price $5000 00 E F Dutro, Zanesville Ohio

1934 STINSON SR5 RELIANT No time since complete motor major just relicensed Absolutely must be seen to be appreciated Never cracked Real bargain can finance might trade $2450 00 Bill Strause Vandergrift, Pa (T)

J 5, 4 PLACE STINSON 75 hours since complete major Uses no oil between changes always hangared high gloss finish bank and turn rate climb compass, Heaters ring full airwheels clock radio, hand starter Best looking and flying J 5 in the country Cash price $1050 00 Harold Perkins, 456 Heratio St., Charlotte, Michigan

STINSON SM8A, motor Airline majored just relicensed has night flying equipment A bargain at $1185 00 will consider Ill Rayo in trade Roland Mahvex Auburn Me (T)

WARNER STINSON 4 place cabin, fully equipped, brakes tail wheel etc $850. Lycoming Stinson SM8A with full air wheels $1200 Pioneer c/o Airport, Syracuse, N Y

Taylor (Cub)

VERY CLEAN 37 Yellow and green Cub J2. Just overhauled With compass lights cabin heater, tail wheel, Perfect condition $875 00 Terms if desired Eddy McEnnon, 12 N Hamilton St Ypsilanti Mich

1937 DELUXE CUB SEAPLANE land plane Edo floats dual ignition metalized Entire outfit excellent Can finance trade $1295 00 Bill Strause, Vandergrift Pa (P) (T)

TAYLOR CUB with enclosure Best cash offer takes it 1935 take tote car and $200 Licensed April 1939 Harold Gulliver, 334 W Pultney St. Corning N Y

Taylorcraft

TAYLORCRAFT DELUXE black with red deluxe trim high gloss. Tail wheel, brakes pants Total time 247 hours, just top overhauled New April 1938 $1400 00 Taylorcraft-standard, green with yellow trim 732 hours total 160 since major New tires and windshield Licensed till July 1939 $850 00 Cincinnati Aircraft Service Lunken Airport Cincinnati, Ohio

1938 TAYLORCRAFT Demonstrator Only 78 hours Price $1100 includes propeller spinner, brakes tail wheel Arens Throttle Pioneer Compass carburetor heater Grey with red trim Ship and motor A 1 condition never damaged, always hangared Write Fairchild Aviation, Incorporated Jamaica New York.

Travelair

TRAVELAIR J6 9 modernized D, 120 hours since major overhaul Plane recovered a year ago Completely equipped for aerial mapping and blind flying Has two way radio Directional Gyro Sensitive Altimeter etc Price with conventional instruments only $2000 Standard Aerial Surveys Inc, Hackensack N J

Waco

WACO Cabin 1933, Continental 210 (10) hours since complete engine major 85 hours since all new cylinders installed heat salt cooled valves new plugs etc Plane recently relicensed Full set of instruments, landing lights flares, steel propeller An excellent buy at $1,835 00 John Abicon Airport Montoursville Pa

WACO "C" 4-place cabin 210 Continental engine beautiful condition just majored newly licensed, special finish ring cowls etc $1685 See this plane Pioneer c/o Airport, Syracuse, N Y

Used Planes—General

(See also Group Classifications)

CHALLENGER ROBIN A 1 condition $750 Whittelsey Avian, just rebuilt and majored $800 Fairchild 22 A 1 condition $1250 Fairchild 21 majored and perfect shape $1150 Lambert Monocoupe majored $2200 Fledg Robin and other parts. Aircraft Brokerage, Airport Flushing L I No 1

WACO "F" 125 Warner engine, just majored, plane recovered starter etc $1375 flyaway J 5 Travelair only $1250 Terms arranged Pioneer c/o Airport, Syracuse N Y No 2

COMMANDER, all or any part, Buhl eight Air Sedan Wasp engines Fokker F 10 Wheels various sizes. Wanted J4 J5 and late Tank engines Dean C Daily Los Angeles Metropolitan Airport Van Nuys, California No 3

THREE SHIPS taken in on trade: 125 HP Savoia Marchetti J 5 Stinson, and Hisso Waco, all licensed and in good shape Make us an offer. Meinke Eldred Flying Service Lost Nation Airport Willoughby Ohio No 4

Engines & Parts

Also see ads marked (P) in Groups

FREE AEROPLANE with motor purchase Easy terms $12 50 down 200 pounds useful load Welded steel construction Propeller—all types—$6 up Sensational values Illustrated information and flying manual 25c Universal Aircraft, Fort Worth, Texas No. 6

EDO Model D 1040 "Cub" Floats, Total time 60 hours $425 00 New 40 HP Motor J 2 Cub with above floats just licensed $1328 00 A-40 3 Continental Motor complete $150 00 Roller Bearing Cub Wheels Goodrich 8.00 x 4 Tires Like new 50% off 2 Leading edge landing lights 20 ampere 12 volt Mogul prefocus base $25 00 1 three minute flare $25 00 Zimmerly Bros Air Trans Lewiston Ida No 6

PARTS FOR DX9 of all sorts, also OX5 motors, magnetos carburetors etc. All at a bargain American Eagle parts, Cub, etc Write for best buys. 1429 Nobles Lane, Pittsburgh Pa. No 7

Continental A40 2 motor recently majored Sell best offer Edo Floats for Cub Also have Stinson Reliant parts Kinner motor parts Pioneer bank and turn Sergeine Al Leeward New Kensington Pa No 8

Equipment & Products

Floats

EDO 1070 FLOATS only 8 hours since rebuilt, with struts and wires for Aeronca C-3 Perfect condition Make cash offer J A Weiss, Jr, 230 Park Ave, New York City No 9

Instruments

FINE SET OF RADIO TEST & SERVICING instruments consisting of the following Clough Brengle Signal Generator Clough Brengle Oscillograph Triplett 1200 volt ohm meter, Triplett volts ammeter Hickock condenser capacity tester. Bendix Dayrad tube tester Complete outfit $125 00 E F Dutro, Zanesville, O No 10

Parachutes

COMBINATION SET IRVING AIR CHUTES seat pack and chest rebuilt at plant last August. 24 ft Pongee silks Also best set of "Bat Wings" in country Make me an offer Julius Sebo 1130 Seventh St. Muskegon Heights, Mich No 11

Parachutes—Continued

IF YOU ARE IN NEED of parachute equipment contact a responsible dealer who has used them and knows the type best suited to your purpose In New York Area see Joe Crane, Irvin Air Chute Dealer, Roosevelt Field. No 12

Radio

AIRCRAFT RADIO TRANSMITTERS receivers and direction finders slightly used taken in trade priced to move, several makes and models get our quotations before buying Lear Developments, Inc. Bldg 31, Roosevelt Field Mineola N Y No 13

Services & Instruction

Instruction

BLONDIN'S AIRCRAFT CHART Authentic question answerer 84 Pictures $1.00 Blondin Chart Co, Box 34, Los Angeles, Calif No 14

C A R AVIATION METEOROLOGY One text one price, postpaid Logical simplified studies for Private Pilots Method of presenting equivalent to private instructions Banishes examination fears $15 Merrie Plan San Antonio Texas. No 15

Catalogues

BROTHER CAN YOU SPARE A DIME—or two? Two new Catalogues are ready One dime brings you either one Two dimes bring you both. Specify whether you want Aviator's Personal Equipment Catalogue or Aeronautical Supply Catalogue or both Karl Ort 605 W. Poplar St. York Pa. No 16

Miscellaneous

GREAT AVIATION COLLECTION SALE—Discount 10% Send for free list of 1000 remarkable aeronautic items—books, pamphlets war flying biographies signed copies technical source books histories, Wright items, Lindberghiana early periodicals, war in the air books, documents etc, etc American Library Service Dept 218 117 West 48th St New York City No 17

Employment

Position Wanted

TRANSPORT PILOT, 1200 hours, 1S 2S 3S ratings. Radio license Experience in all kinds of weather Holder of Aero Underwriters Certificate Age 29 married now employed commercially, wants position flying privately. Box 644, Hingham, Mass

Wanted

SENSITIVE ALTIMETERS Directional Gyros Artificial Horizons also other used Aircraft Instruments Eastern Air Navigation Service, Roosevelt Field, L I, N Y

U S Government

WAR DEPARTMENT Office of the Contracting Officer, Air Corps, Materiel Division Wright Field Dayton Ohio June 24, 1938 To Airplane Designers and Manufacturers.—The War Department invites the submission in competition by sealed communications of new designs covering Single-Engine Radio-Controlled Target Airplane complete with all ground control and operating equipment together with statement of price for which any such design in whole or in part will be sold to the Government. Communications containing designs and prices therefor must be submitted to the Contracting Officer Wright Field Dayton Ohio not later than November 15 1938, no communications received after 1 00 P M Eastern Standard Time on said date shall be considered. Winner or winners of this competition will be determined as provided in the Act of July 2, 1926 (44 Stat. 785) The Government will require not to exceed one hundred (100) of the type of airplane referred to and will reserve the right to contract with a winner of the design competition for the construction of said airplanes in the event that said winner is qualified to manufacture same. A copy of the circular proposal covering this design competition and containing instructions in regard thereto will be furnished upon application therefor to the Contracting Officer Wright Field, Dayton, Ohio E T Kennedy Major, Air Corps Contracting Officer

WAR DEPARTMENT Office of the Contracting Officer, Air Corps Materiel Division Wright Field Dayton Ohio, August 23 1938 To Airplane Designers and Manufacturers.—The War Department invites the submission to competition by sealed communications of new designs covering Short Range Liaison Observation Airplane with statement of price for which any such design in whole or in part will be sold to the Government. Communications containing designs and prices therefor must be submitted to the Contracting Officer Wright Field, Dayton Ohio, not later than February 23 1939 no communications received after 1 00 P M Eastern Standard Time on said date shall be considered Winner or winners of this competition will be determined as provided in the Act of July 2 1926 (44 Stat. 785) The Government will require not to exceed fifty (50) of the type of airplane referred to and will reserve the right to contract with a winner of the design competition for the construction of said airplanes in the event that said winner is qualified to manufacture same. A copy of the circular proposal covering this design competition and containing instructions in regard thereto will be furnished upon application therefor to the Contracting Officer, Wright Field, Dayton Ohio

AVIATION'S MARKET PLACE

MORE FOR YOUR MONEY!

Brown Glove Leather Helmet, perfect fitting five-piece design. Unlined $1.65, Chamois lined $2.65, Fur lined $4.00.

Brown Glove Leather Jacket, wool knit trim, sateen lined, $7.25. Jacket and chamois-lined helmet to match $9.10. The set, with chrome-bound shatter-proof goggles $11.25. State size.

SNYDER AIRCRAFT CORPORATION
Municipal Airport — Chicago, Ill.

☐ Jacket ☐ Jacket and Helmet ☐ Jacket, Helmet and Goggles

Ship to:

Size

Postage extra — Cash with order — C.O.D.

WACO 1938 MODEL N (TRICYCLE) DEMONSTRATOR

Only 50 hours. Beautiful finish French Grey trimmed in Blue. Complete set of instruments and lights. Extra 60 gallon gas tanks, RCA radio, clock, carburetor temperature gauge. Only $9,500.00

WACO 1938 CUSTOM DEMONSTRATOR

Only 150 hours. Beautiful finish WACO Vermilion trimmed in Black. Complete set of instruments and lights. Extra 65 gallon gas tanks. RCA Radio compass, Kollsman sensitive altimeter, carburetor temperature gauge, clock, Sperry Horizon, flares. Only $9,500.00

The above are two practically new airplanes at second hand prices.

WACO 1933 CABIN

Modernized 210 h.p. Continental engine. Just major overhauled. Has been privately owned. Extras include lights, flares, bank & turn, rate of climb, radio, steel prop, wheel pants, and 70 gallon gas tanks. Price $4,000.00

The above planes must be seen to be appreciated. Write or wire for complete details. Do not delay.

THE H. C. ROBBINS COMPANY
Cleveland Airport — Cleveland, Ohio.

OCTOBER VALUES

CESSNA, 1937, Late C-34 model. Engine majored and heavy shaft installed 10 hrs. back. Less than 200 hrs. total. Equipped generator, rate of climb, turn and bank, Curtiss Reed prop, electric flaps, starter. Looks like brand new ... $4,200.00

CESSNA, 1937, Equipped generator, starter, electric flaps, recently majored, less than 250 hrs. total. Excellent ... [illegible]

MONOCOUPE DE LUXE, 1936 Model, Lambert 90. Only 70 hrs. total time, bank & turn, rate of climb, thermocouple, leather upholstery, wheel pants, brakes, navigation lights, cream and green finish. Perfect throughout ... 2,500.00

MONOCOUPE, Warner 145. Ship and engine in best of condition. Goodyear wheels and brakes, steel prop, lots of extra instruments, cabin heater, steerable tail wheel ... 1,600.00

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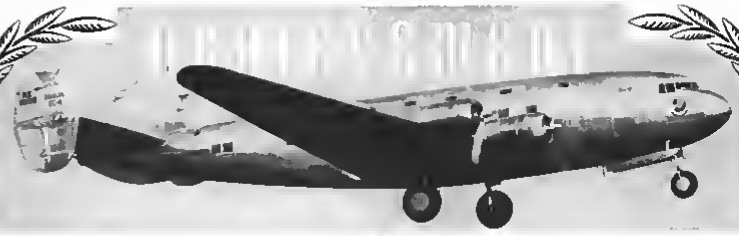

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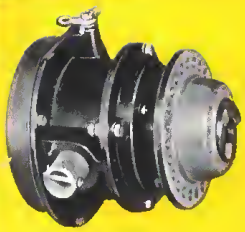

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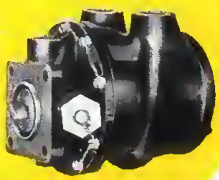

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